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A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
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IDAHO COMMISSION RULES IN FAVOR OF THE DIFFERENTIAL.

A ruling that will be studied with interest by public utility corporations has recently been handed down by the Idaho Public Service Commission in the case of the Pocatello Gas and Power Company versus the Southern Idaho Water Power Company. It was alleged that the latter company has discriminated in its charges in competing with the complainant for business in Pocatello. It is averred that the rate offered by the defendant for water heaters is less than cost, discriminating against consumers using current for other purposes, and that it was instituted for the sole purpose of unfairly competing with the complainant in the water-heating business. The report indulges in some philosophy respecting the measures which must apply in arriving at a conclusion as to what this or any other charge might be. The point of prime interest in this issue is taken that the water-heating service is only one of many classes of service and uses to which electricity is now put. It is assumed that the use of electricity for illuminating purposes is at the present time the highest use to which it can be put. Its use involves the employment of plant and equipment from three to four hours a day, and takes precedence over all other uses. Energy must be furnished for this use at all hazards. The rate for other services, therefore, must necessarily be interdependent upon and revolve around the lighting rate. The evidence shows that even after considerable advertising and soliciting only a few customers for this particular service have been secured even at the low rate. No great progress in securing this class of business has been made. It is reasonable to assume then that were it not for the low rate considerably less of such service could be secured, and it then follows that if this service could not be secured the revenue therefrom would be withheld from the company and it would then be necessary to charge a higher rate for the other services in order to maintain the organization as a profitable business.

Another interesting point of view relates to the disposition the Commission makes of the contention of the complainant that it could afford to furnish gas for this service at a certain rate and compete with the electrical company if the latter were compelled to raise its rates. The Commission says that it would hardly be justified in compelling the defendant company to raise its rates for electrical energy for this class of service so as to enable the complainant company to compete with it in that service.

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INDUSTRIAL ELECTRIC HEATING.

There is a great field for the acquisition of future business on the part of central stations in industrial electric heating. In fact, those who have given the greatest amount of study to this question are emphatic in proclaiming that the possibilities in this field are without parallel in the annals of the central-station industry.

While possibly there is no immediate prospect of an industrial heating load comparable with industrial power, save in a few isolated cases, there is every reason to believe that the heating business will in the near future comprise an appreciable percentage of the entire business of the central station and certainly no more desirable load could be had.

In Toledo, Ohio, for instance, the local utility recently closed a contract with the Willys-Overland Company calling for a 6,000-kilowatt heating installation in enameling ovens, this equipment replacing steam and gas heating. In this case an increase in production of 40 per cent is conservatively estimated because of the shorter time required for electric baking. When this item alone is considered the low unit cost of gas or steam heat in comparison with the kilowatt-hour cost for electrical energy becomes almost a negligible item.

Enameling is just one of many possible applications of electric heat, and the automobile industry one of many that could profitably enjoy electrical energy for this purpose as well as for power and lighting.

An indication of the importance of this subject to the central-station industry is the action of the National Electric Light Association in devoting an entire session at the recent San Francisco convention to industrial electric heating. Several papers of especial interest were presented and much profitable discussion ensued. Of patricular interest was a paper by Mr. F. T. Snyder of Chicago dealing with electric-furnace power loads. He aptly summarizes the entire situation in the statement that "among those who are in contact with the more recent installations of electric furnaces in the lines naturally tributary to purchased electric power it is quite evident that there now exists the possibility of a prompt development to large proportions. How rapidly this development will arrive and what proportion of it will become purchased power will be largely determined by the attitude and policies of the power companies." It is, perhaps, not realized by central stations that there are about 1,000,000 horsepower of electric furnaces in regular operation throughout the world, an amount of power quite sufficient to justify serious consideration from power producers and to disprove the somewhat common belief that the electric furnace has not yet been commercially perfected.

The United States at present has electric steel-making capacity under 100,000 tons per year. The total production of steel from all kinds of fuel furnaces is some 30,000,000 tons. A number of years ago it became evident that steel, when required in small quantities, could be made at less cost in electric furnaces than in fuel furnaces. Later developments have proved that electric steel furnaces can produce steel at any tonnage rate at a cost lower than in fuel furnaces and it is uniformly true that the quality of the product is much superior.

From the standpoint of the central station the electric furnace load is extremely desirable. While only a few installations may operate 24 hours a day, 12-hour operation is quite general, even where the working hours are nine or 10 a day. In actual experience electric furnaces show an annual load-factor on 12-hour service of about 40 per cent and about 70 per cent with 24-hour service. Also the intermittent character of the service permits of shutting down during peak hours of the central station without serious loss of temperature.

Industrial electric heating is rapidly coming into its own and a central station can well afford to give serious consideration to the technical and commercial problems involved, all of which are possible of easy solution.

THE GENERAL BUSINESS OUTLOOK.

This country is blessed by length and breadth; by a variety of climatic conditions; with every degree of temperament, an illimitable range of courage, and with a complexity of racial instincts and tendencies which effect a balance and produce what we are wont to call our Americanism.

We have strong feelings here, but they hardly approach embitterments. We are, unconsciously, even more than the old gentleman of France, "one for all and all for one." Consequently, it may be predicated that our mutual interests and interdependence will force us to maintain amicable relations and solve our problems peacefully.

A transcontinental train, making the trip from coast to coast, is ample evidence of the variety of nationalities, of the differences of point of view and of the solidarity of love of the adopted country. Getting away from the big industrial cities and sweeping out into the reaches of Wyoming, Nebraska and the Dakotas, the immensity of the productive factor becomes apparent, and in every mind is the idea that we hardly know the greatness of the land in which we live. Anyone traveling across the country today, whether by the northern or southern route, may see unparalleled evidences of the agricultural wealth of the land. Prosperity is apparent on every hand, and despite the continued struggle abroad, with its depressing effect here, there reigns predominant a cheerful note and an expectation of better things to come.

In the very interesting publication called "Copper Gossip," issued by the National Conduit and Cable Company, the statement is made that in many lines of industry there is extraordinary activity at present, and it is hoped that the general business situation will soon feel the stimulus of improved conditions. It is true that we are being deprived of an immense buying power for materials of construction and fabrications of peaceful arts. On the other hand, there are immense

war orders coming to this country from foreign nations and these have created a condition of great activity at many leading centers of manufacture. Underlying conditions in the country appear to be sound, and it may be expected that as the temerity which naturally and reasonably accompanies an unexpected and hardly understood condition such as we have been experiencing for the last six months is passed, business in every direction will move steadily forward to a period of great material prosperity.

In the electrical industry there have been many ups and downs recently. The genuine misapprehension which existed at the beginning of the year, however, is beginning to give way to a more settled policy of conservative expansion, and in many parts of the country inquiries are looking up. The electrical supply jobbers are securing a little more business, but while there are many orders, the aggregate volume is small and the cost of handling is considerable. The impulse of a better buying mood is apparent, and the promise is that this tendency will be maintained if not accelerated. Many of the articles entering into electrical construction are made of the stuff from which war material is devised. This has already had an unsettling effect upon the metal market, and the probability is that for some time at least an increasing cost for raw and finished material will be the order of the day. In this emergency the electrical industry must take its courage in its hand, and rather than make extraordinary sacrifices in effort and profit in order to hold down the price, put its selling organization with all the vigor and intelligence at its disposal behind the determination that the things are necessary and worth the cost.

THE ELECTRIC VEHICLE AND THE CENTRAL STATION.

One of the most interesting reports presented to the recent San Francisco convention of the National Electric Light Association, was that relating to the central station and the electric vehicle. The joint authors were Mr. John F. Gilchrist, president, and Mr. A. Jackson Marshall, secretary, of the Electric Vehicle Association of America. A brief abstract of this report is published on other pages of this issue. Central-station managers wherever the electric vehicle may be used, either for company purposes or its use advocated for both passenger and commercial service, should make a careful study of the complete report which is available through the agency of either of the above named organizations.

The managers of electric light and power companies have been scolded a good deal by the electric vehicle manufacturers and by those electric vehicle enthusiasts in the central-station field who have put their organizations behind the movement of increasing the use of the electric vehicle and have found themselves greatly the gainers thereby. We cannot all of us attend all of our affairs with the same enthusiasm in the same directions. The report calls attention to the fact that comparatiely few central-station organizations appreciate the opportunities that a vigorous prosecution of electric vehicle propaganda offers. The advancing of testimony and the establishment of concrete fact with respect to the preliminary methods to be employed and the results to be obtained, such as are included in the report under discussion, will continue to bolster up the faltering faith of those who are making the attempt and make converts to the cause.

No one doubts now the conclusion that the horse as a draft animal is rapidly passing from the scene of social and commercial activities. Within a short time transportation of every description will be motorized, and prompt and vigorous action upon the part of central-station managers and electric vehicle interests is necessary if the electric is to benefit.

The work being done in establishing a better understanding of the possibilities of the electric vehicle by the Electric Vehicle Association is splendid, and the sympathies of the central-station managers of the country are with the latter organization. As the utilization of the electric vehicle increases many heretofore apparently complex problems will solve themselves. This is the history of the development of every great movement. Because these problems will ultimately solve themselves is no reason why those most interested should view the situation with complaisance.

Abroad we find our British brothers enthusiastic over the possibilities of the electric vehicle, and we direct attention to the stirring words of Mr. Frank Ayton, honorary secretary to the Electric Vehicle Committee of the Incorporated Municipal Electrical Association, published in the Electric Vehicle Section in this issue. We believe that over here we take the lead in imaginative faculty and in our forward attempts to have electrical energy perform a multitude of services. An examination of the report presented by Mr. Ayton will indicate that he and his associates are not at all backward in finding for the electric many uses to which, up to the present time, we have given scant attention. The suggestions outlined for the adaptation of the electric for various municipal services are easier to accomplish in Great Britain where there are so many electrical supply undertakings in control of municipal departmental work. It is a fact that practically every city worth while in this country is a good customer of the privately owned central station, and we are in a position here to increase the use of electrical energy by advocating the adaptation of the electric to municipal service.

The more we study the agency and the opportunity, the more inclined we are to get strongly behind the work of the Electric Vehicle Association and bespeak for it the hearty co-operation of [illegible] only the central-station interests but of [illegible] organization inter-

Electrical Exports for April.

The following data on the electrical exports of the United States for April are from the official government report on the foreign commerce of that month issued by the Bureau of Foreign and Domestic Commerce.

A decided general improvement is shown by the electrical-export figures for April, the total value of these shipments being higher than for any month since March, 1914. An increase of over 15 per cent is shown in the electrical total compared to that of April, 1914. For the four classes for which the number of articles shipped is reported, there were sent out in April the following: Electric fans, 4,523; arc lamps, 35; carbon-filament lamps, 248,338; metal-filament lamps, 196,725.

The following table gives the detailed figures for the various electrical classes reported, together with the comparative figures for the corresponding month of last year.

Articles	April, 1915	April, 1914
Batteries	$ 88,372	$ 65,001
Dynamos or generators	127,071	176,469
Fans	61,926	38,525
Insulated wire and cable	354,344	86,993
Interior wiring supplies, etc. (including fixtures)	67,605	60,891
Lamps—		
Arc	554	1,063
Carbon-filament	27,665	4,621
Metal-filament	36,936	20,820
Meters and other measuring instruments	69,835	.....
Motors	193,802	341,369
Static transformers	47,763	93,247
Telegraph instruments (including wireless apparatus)	14,377	8,654
Telephones	89,730	73,061
All other	875,395	770,837
Total	$2,055,375	$1,741,551

Preston S. Millar Addresses Kansas City Electric Club.

The Electric Club of Kansas City, Mo., which suspends its semi-monthly luncheons during the summer months, held a special meeting June 25 to hear from Preston S. Millar, secretary of the Electrical Testing Laboratories, New York, on his way east from the Pacific Coast. Mr. Millar urged the club to have at least one program in the year devoted to illumination, and suggested co-operation with the Illuminating Engineering Society to this end. His advice was the conclusion of his talk on the illuminating features of the San Francisco Exposition, and on the modern ideals in home and other illumination. He said that whereas a few years ago the aim was increased lighting efficiency and reduction of use of current for the customer, the present aim is increased attractiveness and harmony of effects, with a result of largely increased use of current, as well as larger sales of equipment. "A visitor in a home equipped with the modern numerous fixtures is charmed and attracted, and wishes similar effects for his own home," said Mr. Millar. "So satisfactory is the newer illuminating ideal, that it behooves all electrical interests to exploit it." Mr. Millar upon request told of many of the novel duties of the Laboratories, indicating the latest requirements put upon electricity. One of the most interesting was his relation of the devising of a means of creating color effects for a "color symphony," the device having been successfully employed, and to be put on tour this fall.

Cincinnati Electric Club Entertains.

The Cincinnati Electric Club, composed of a larger number of electrical men than any similar organization which has ever existed in the city, held its first regular meeting following its perfected organization last week, the affair taking the shape of a dinner at the Zoo under very pleasant auspices. More than one hundred members attended, showing convincingly the enthusiasm which is felt over the new organization. Several addresses were heard, in which the desirability of close co-operation between the various branches of the trade urged. Meetings will be held during the summer.

Convention of Colorado Association.

Announcement is made that the thirteenth annual convention of the Colorado Electric Light, Power and Railway Association will be held at Glenwood Springs, Col., on September 23, 24 and 25, 1915. Plans are being worked out that will insure one of the most successful conventions in the history of the organization.

T. F. Kennedy, of the Denver Gas and Electric Light Company, is secretary.

New York Electrical Society Elects Officers.

At the annual meeting of the New York Electrical Society, held June 15, the following officers were elected:

President, Elmer A. Sperry.

First vice-president, George W. Elliott.

Second vice-president, S. N. Castle.

Third vice-president, Bernhard Hoffman.

Secretary, George H. Guy.

Treasurer, Thomas F Honahan.

Competitive Economy Test of Tungsten Filament Lamps—A Correction.

In the article entitled "Co-Operative Economy Test of Tungsten Filament Lamps," in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of June 26, an error occurs in the seventeenth line of the third column, page 1201. The word "voltage" should read "wattage."

Columbus Jovians Have Big Day.

A lamb barbecue was the chief feature of the annual picnic participated in by 200 Columbus, O., Jovians and 100 guests at Buckeye on June 23. Incident to the affair, local electrical stores were closed and employees given a holiday. The proprietors and officers all held invitations to the picnic. Buckeye Lake, which is the most popular resort of central Ohio, lies about 30 miles east of Columbus. A special car was run by the New York Central lines. Many of the picnickers went by trolley and a still greater number by automobile. Thus the crowd kept gathering from 6 o'clock in the morning until nearly noon. The private grounds of the Sunset Fishing Club, of which some of the Jovians are members, was the scene of the picnic.

On the programme of sports was a base ball game between the manufacturers and jobbers. This resulted in a draw, as dinner was announced before the game was over. The fishing contest was won by C. H. Temple, of the Central Union Telephone Company, Columbus. He caught 15 fine cat-fish, which were secretly appropriated from their place of display and eaten by some of his friends who remained at the lake until the next day. Harry B. Kirkland, vice-president of the American Conduit Company, Pittsburgh, was the winner of the men's quoit-pitching match. An exhibition of fancy swimming was given by Percy Worth, of Cincinnati, the aquatic Jovian jumping from and regaining the deck of a sail-boat moving at the speed of seven miles an hour Practically all the motor-boats on the lake, as well as a number of other boats had been chartered by the Jovians. Bathing, with incidental water sports, was one of the enjoyable pastimes.

The barbeque had a novel setting. Eight lambs were roasted whole. The pit where they were being thus prepared was kept covered by a canvas while the picnickers were seating themselves for the feast, and then this covering was withdrawn to give all a view of the carcasses before removal from the spits. The dinner was bountiful in other delicacies besides roast lamb. The picnic broke up at six o'clock. It was the largest outing ever held by Columbus electrical men, and so taxed the resources of the grounds as to make a new location advisable next year. Among guests from a distance were Oscar Carman, of Indianapolis; Percy Worth, of Cincinnati; S. W. Scofield, of Cleveland; Charles Crofoot, of Cincinnati; H. B. Kirkland, of Pittsburgh, and Leo Mockenhaupt, of Chicago.

The local committee of arrangements, to whom the fine success of the affair was due, was William Hopkins, Erner-Hopkins Company; Arthur Loeb, Avery-Loeb Electric Company; Lawrence Sackett, Sackett Mine Supply Company, with Tribune Carl Metz acting as ex-officio member.

The Second Pan-American Scientific Congress.

During the present year two great Pan-American gatherings convene in Washington under the auspices of the Government of the United States. The first of these, the Pan-American Financial Conference, occurred the week of May 24. Of greater interest to the electrical world, however, is the Scientific Congress that will convene in Washington beginning December 27, 1915, and concluding its sessions on January 8, 1916. The first congress of this name was held in Santiago, Chile, in 1908. It had its origin in earlier Latin-American scientific congresses; and at the time of the Santiago congress was enlarged through the generous initiative of the Latin-American countries to include the United States. This Congress was well attended by visiting delegates from the United States. On its adjournment, entirely unsolicited on the part of the latter, Washington was designated as the place of meeting of the Second Congress.

The Scientific Congress will concern itself with constructive discussion and contributions in the domain of pure science, wherein great advance has been made since the last Congress in Santiago, Chile. Science is comprehensively defined by the Congress and includes, under nine heads, these subjects: anthropology; astronomy, meteorology and seismology; conservation of natural resources, agriculture, irrigation, and forestry; education; engineering; international law, public law, and jurisprudence; mining and metallurgy; economic geology, and applied chemistry; public health and medical science; transportation, commerce, finance and taxation.

The Governing Board of the Pan-American Union, composed of the diplomatic representatives of the participating Latin-American countries with the secretary of state of the United States as ex-officio chairman, has honored the Second Pan-American Scientific Congress by authorizing the use of its beautiful building for the office and sessions of the Congress. The Board also authorized the director general of the Pan-American Union, John Barrett, to act as secretary-general of the Scientific Congress. As the program is developed, further announcements will be made.

W. J. Norton.

From time to time during recent years much has been said with regard to the desirability, not to say necessity, of having the engineering fraternity represented upon boards of public control and commissions having to do with the regulation of public utility corporations. The adaptability of the engineer, due first to his course of study, and second to his habit of scientific observation, for work involving intimate analysis of complex problems, is recognized. It is highly satisfactory, therefore, that the all-around ability of the engineer and the later training of the statistician and student of regulatory measures, are recognized in the election of William J. Norton as chairman of the Chicago Section of the American Institute of Electrical Engineers. Mr. Norton has had a unique experience in engineering. He was born on July 17, 1878, at Baltimore, Md. He attended Cornell University from 1898 to 1902, receiving the degree of Mechanical Engineer in the latter year. From 1903 to 1907, he was engaged in engineering work with the Chicago Edison Company, the New York Ship Building Company, and in 1905 was made vice-president and general manager of the Federal Sign System (Electric). From 1907 to 1911 he was assistant secretary of the Public Service Commission for the First District of New York. His work was of an administrative and executive character in connection with rapid transit problems, valuations of street railway properties, and with the regulation of electric light and power companies. From 1911 to 1913 he was engaged on special rate engineering work for the Commonwealth Edison Company of Chicago in connection with the investigation of rates by the Chicago City Council. This work concluded with the passage of an ordinance by the City Council, almost unanimously, and acceptable to the company. In December, 1913, he organized the consulting engineering firm of Norton & Bird, with Paul P. Bird, who had formerly been smoke inspector of the City of Chicago and later special power engineer for the Commonwealth Edison Company. During 1914 and 1915 this firm has been engaged in special rate work for many of the electric lighting and power companies throughout the United States, and has made complete valuations of the electric properties of the Union Gas and Electric Company, Cincinnati, O., and for the eight gas and electric properties of the Public Service Company of Oklahoma. The firm is now engaged in making a complete gas valuation for the Union Gas and Electric Company. It has made special investigations of several municipal electric plants, was retained by the Merchants' Association of New York City in the complaint against the New York Edison Company, and is now under retainer by the Maryland Public Service Commission in the complaint against the Chesapeake & Potomac Telephone Company, of Baltimore. In addition to this great activity, Mr. Norton has taken a conspicuous part in the work of the National Electric Light Association and in other engineering and scientific organizations. In 1911 he was secretary of the Rate Research Committee of the National Electric Light Association, and has been a member of this committee since 1914. He is editor and publisher of "Rate Research," author of the Annotated Edition of the Illinois Public Utilities Commission and Municipal Ownership Law, and editor of the "Public Service Commission Department" of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

W. J. Norton,
Chairman, Chicago Section, American Institute of Electrical Engineers.

Annual Banquet of Milwaukee Company Section.

The third annual banquet of the Milwaukee Company Section, National Electric Light Association, was held at the Hotel Pfister, Milwaukee, Wis., Tuesday evening, June 29. Several papers and addresses were delivered relating particularly to street lighting, this subject being especially pertinent at this time because of the completion of the survey on Milwaukee street lighting conducted by the firm of Vaughn, Meyer & Sweet. Gerhard A. Bading, mayor of Milwaukee, acted as toastmaster, and included among the guests present were several aldermen and city officials directly interested in street lighting.

F. A. Coffin of The Milwaukee Electric Railway & Light Company, was the first speaker, choosing for his subject, "Historical Development of Street Lighting." Mr. Coffin reviewed the progress of lighting from the earliest forms to the present highly efficient nitrogen-filled incandescent lamp. He stated that the first public lighting was purely a police and safety measure and, while in later years the esthetic element has entered largely into exterior lighting, still the principal function of any system of street illumination is to provide against accidents and crime.

The subject of street lighting as an aid to public safety was dealt with briefly by Milton C. Potter, superintendent of schools, Milwaukee. Mr. Potter contended that the cost of lighting streets is but a small premium on insurance against accidents, crime, etc. As a concrete example he referred to an installation at Carson City, Nev., costing $125 per lamp and quoted statistics showing the extent of the reduction in crime and number of accidents which indicates that the cost, although high, is a profitable investment to the city.

Edwin S. Mack of Miller, Mack & Fairchild, local attorneys, spoke briefly on essentials of a street-lighting contract. He emphasized the fact that a street-lighting contract between a municipality and a public utility must primarily be definite and all conditions clearly stated. The duration of a contract is also vital to both city and company as this item largely determines the price for which a company can furnish service. He also thought that contracts should specifically provide for any future advances or improvements in lighting equipment or methods, allowing, of course, for proper compensation to the company for installing such improved equipment. The question of outages should also be dealt with definitely.

Edwin Gruhl, assistant to the president of the North American Company, controlling The Milwaukee Electric Railway & Light Company, presented statistics on the cost of street lighting in municipally owned and operated plants. He referred particularly to conditions in Chicago, Detroit, Winnipeg and Seattle, pointing out that in municipally lighted cities such as these, there are no standards, as each successive engineer installs what in his estimation is the best system. He quoted from a survey made by the Railroad Commission of Wisconsin dealing with street lighting in Milwaukee furnished by the utility and as proposed by the municipality. These figures show that it would cost $46,846 more to light the streets if undertaken by the city than if supplied by the utility, principally because of the duplication of equipment at present available for this service. The investment per lamp under municipal operation would be $422 as compared with $328 with company service. Summarizing the comparisons Mr. Gruhl stated that electric company service would be 28 per cent less expensive than municipal ownership. Figures were also presented showing the higher cost of street lighting in the cities having a municipally operated street lighting system.

F. A. Vaughn, of Vaughn, Meyer & Sweet, spoke on the subject of "Technical Designs of Street Lighting Systems," quoting largely from his report recently completed and abstracted in our issue of June 26, 1915. He showed lantern slides of various types of equipment for street lighting, distribution and efficiency curves of various types of units and diagrams of the proposed Milwaukee installation.

Edgar Switzer of the Westinghouse Electric & Manufacturing Company, dealt with the subject of "Modern Types of Street-Lighting Equipment." He reviewed the development of street-lighting units from the open arc to the present gas-filled incandescent lamp. He thought that the magnitite arc represents the greatest development in street lighting units and the early objections to this lamp have been entirely removed. Maximum illumination is given at an angle of 10 degrees from the horizontal, which is particularly desirable for street lighting and a rectifying system has been developed which is entirely satisfactory. He urged that these lamps be given serious consideration where a street lighting equipment is being considered.

Details of the design and use of refracting glassware for street-lighting service were given in a talk by W. A. Dorey of the General Electric Company. Lantern slides showing the distribution of light by means of these refractors were shown and descriptions given of equipment which will meet the specifications of the proposed Milwaukee system.

The program was closed with a brief address by Eltinge Elmore, president of the Milwaukee Retail Merchants' Association on the commercial advantages of street lighting. He spoke first of the advertising value of well lighted streets and of the influence of good light in accident and crime prevention.

Electric Club-Jovain League of Chicago.

Prof. F. R. Moulton, of the University of Chicago, delivered a very interesting illustrated address before the Electric Club-Jovian League of Chicago on June 24, the subject being "The Wonderful Heavens." Lantern slides of actual photographs of the sun, moon, stars, etc., taken with the aid of powerful telescopes were shown and explained.

President Pinckard reported that progress is being made by the Picnic Committee and all indications point to the most successful outing in the history of the club. Thursday, August 5, has been selected as the date for the affair, which will again be held at Ravinia Park.

H. A. Mott, chairman of the general committee, has appointed Perry Boole chairman of the Prize Committee, and it is believed that the record of last year, when prizes aggregating over $1,000 in value were secured, will be exceeded.

H. E. Niesz has been made chairman of the Publicity Committee.

Classifications of Technical Literature Wanted.

The Joint Committee on Classification of Technical Literature is making a collection of classifications of applied science which have been developed independently in the offices of manufacturing plants or engineering firms. Classifications which exist in manuscript form and have been used for filing or indexing data are particularly desired. The committee is also collecting copies of any extensions of present systems to cover special activities or branches of engineering not now fully covered by published classifications. Contributions should be sent to W. P. Cutter, secretary, 29 West Thirty-ninth Street, New York, N. Y.

Chicago Section, Electric Vehicle Association.

The last of the regular weekly meetings of the Chicago Section, Electric Vehicle Association of America until September, was held on June 29 at the Metropole Hotel. H. W. Howard, of the B. F. Goodrich Company, delivered an address on "Latest Developments in the Automobile Tire Industry."

The Board of Public Utilities Commissioners of the Philippine Islands, in a recent ruling, fined a transportation company operating an automobile line in Leyte $100 for cutting the scheduled price for carrying passengers.

The Centrifugal Pump from Standpoint of Central Station.

By T. D. Rose.

This article discusses in a comprehensive manner the characteristics and performances of centrifugal pumps with comparisons with other types. Data are given on the types of pumps suitable for specified services and recommendations made as to the method of drive. The entire subject is treated from the standpoint of the central-station power engineer.

The commercial adoption of many pieces of power apparatus depends now, to a large extent, upon the central-station power engineer. In his work in direct contact with the industrial establishments, where he has become, in many cases, the "consulting engineer" for the owner of the plant, the installation of power equipment is governed to a large extent by his experience and judgment. In this work it has become necessary that he familiarize himself with all kinds of machines. He wants to know their construction, their application, their characteristics, their advantages and their disadvantages. In following out this line of work he can hardly find a more interesting and a more important machine, at the present time, than the centrifugal pump. The field is a fertile one and one that is becoming more important every day as the central station spreads its wings over the industrial world.

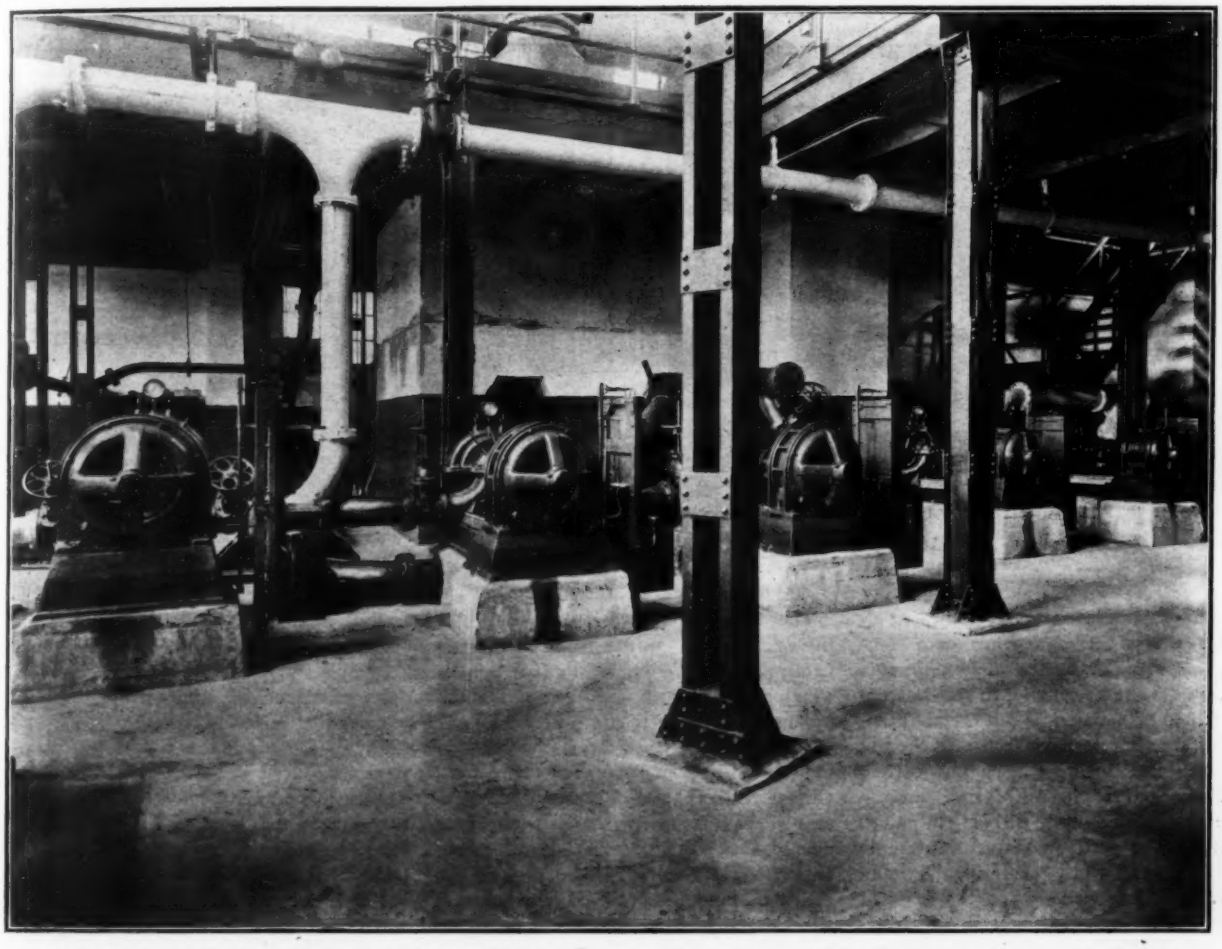

Fig. 1. Three Eight-Inch and Two Six-Inch Centrifugal Pumps Driven by 35 and 25-Horsepower Motors Respectively.

The centrifugal pump has long been considered to be a more or less mysterious piece of apparatus and only those actively engaged in its manufacture have given the subject sufficient study to remove its veil of mystery. The commercial adoption of this pump has probably been held back for two reasons: The insufficiency of published information on its characteristics, and the lack of a satisfactory method of drive. The first reason hinges upon the second, in that without a satisfactory method of drive there was no necessity for published information. With the successful operation of steam turbines and electric motors, the question of drive was solved and it is probable that then the use of the centrifugal pump took its impetus. It was not, however, until the central station took seriously to the extension of its power business and began the scientific application of electric motor drive that the centrifugal pump really left the laboratory and power house, and entered the industrial field. This development has gone so far now that it is safe to say that the future adoption of central-station service to pumping business depends almost entirely upon the centrifugal pump. In view of that fact, it behooves the industrial power engineers of the central-station companies to thoroughly familiarize themselves with the characteristics of the pump.

It is, therefore, the object here to discuss the general construction and operation of the pumps; to show their application to various classes of pumping, to bring up the important points to be considered by central-station power engineers

before making an installation and at the same time to show its advantages and disadvantages. During the discussion of the various types of pumps and their characteristic features, it will not be the writer's object to advocate the adoption of any particular design, but to give, as far as possible, an unbiased résumé of the study of several text books and manufacturer's publications on the subject. The sources of information on centrifugal pumps are few, and in most cases the subject is presented by some manufacturer whose experience has been along certain lines, and who conscientiously presents his own side of the question. We shall, therefore, strive to look at all sides of questions where a difference of opinion is found and endeavor for ourselves to decide upon the best solution.

The term "centrifugal," when applied to pumps, would seem to indicate all pumps whose action depends upon centrifugal force, or as the dictionary puts it, upon "the force tending to recede from the center of rotation." But certain manufacturers seem to have restricted the use of the term to pumps having certain peculiar features in the design, and to have applied the word "turbine" to pumps having other peculiar features, while in either case the word "centrifugal" would apply equally as well.

In just the same manner in which action of an electric motor is the converse of that of an electric generator, so the action of a water turbine is the converse of that of a centrifugal pump. The reaction water turbine evolved from the early observed fact that when water issues from a vessel there is a reaction on the vessel tending to cause motion in a direction opposite to the jet. Therefore, in the centrifugal pump, when the vessel or impeller, which is filled with water, is revolved there is a reaction on the water tending to cause motion in a direction opposite to that of the impeller. In case of either the turbine or the pump the wheel passages must be completely filled with water.

The centrifugal pump consists of a revolving part, called the impeller, or rotor, revolving in a casing so designed as to direct the path of the water. The impeller consists of a hub on which are fastened blades or vanes curved from the hub in the form of a spiral. The object of the shape is to give the water such a path through the impeller, that its flow will not be marked by eddies or sharp changes in direction of flow. The entire success of every centrifugal pump depends upon the shape of this path of water through the pump and the pump that has the smoothest path of flow, both through the impeller and through the casing, will be the pump with the highest efficiency.

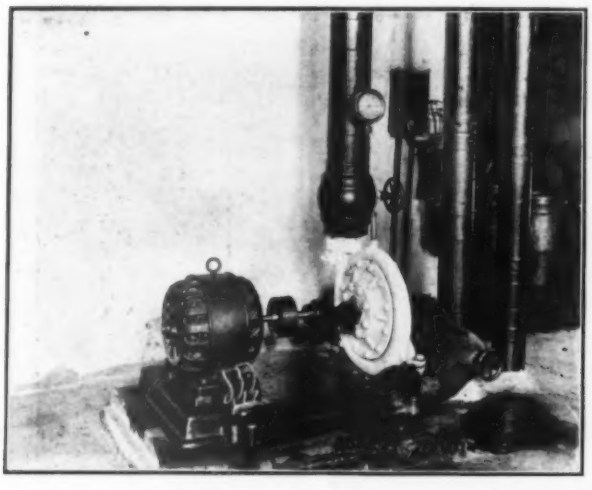

Fig. 2. Small Volute Brine-Circulating Pump in Ice-Cream Factory.

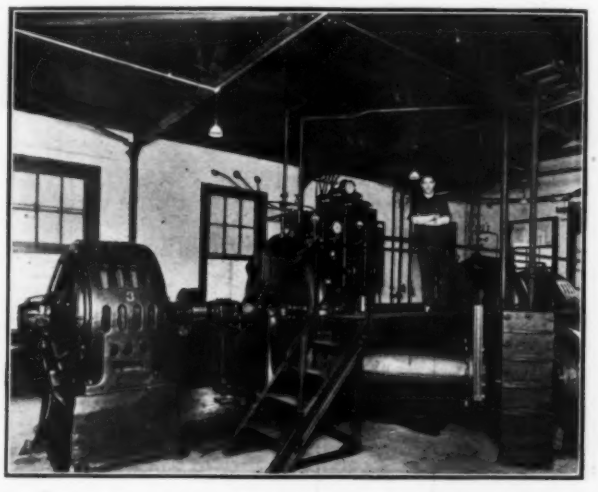

Fig. 3. Two 18-Inch Single-Stage Pumps Driven by 450-Horsepower Motors.

The description just given is applicable to impellers used on all types of centrifugal pumps, so we might say that the determining factor in the different styles of pumps is found in the different shapes of casing used. As stated, the path of the water through the entire pump must be free from shocks. Therefore, the general shape of the suction and discharge openings and the casing itself must conform to the theory of the design. In order that no head may be lost due to shocks and abrupt changes in velocity, use is made of two different designs. In the one a whirlpool chamber or volute casing is used and in the other stationary or movable diffusion vanes. In either case the object is the same; to divert the water smoothly from the impeller into the discharge openings. These whirlpool chambers or vanes are usually in the form of an archimedian spiral.

The pumping conditions applicable to centrifugal pumps may be divided into two general classes, low-lifting duty and high-lifting duty. Until recently the centrifugal pump has not been very satisfactory for high-lift work, on account of poor design. Prior to 1901 the pump was considered to be limited to low-head work, but, at that time, the experiments of certain manufacturers proved that it was applicable to very high heads and, at the same time, capable of operating at as equally high efficiencies as at low heads.

The style of pump used for low-lift pumping is of the single-stage volute type. This type of pump is not adapted to very high speeds on account of difficulties in the design of the impellers. The head at which a pump will operate is dependent upon the peripheral speed of the impeller. Therefore, if the pump is to operate against a low head, it must have either a low speed, or a small impeller at high speed. In using a small impeller the designers have found difficulties in the construction of the impeller vanes. Special high-speed pumps to handle this class of work have been designed and are called screw or propeller pumps. The design and general construction of these pumps will be described later.

For high-lift pumping two different designs have been worked out both employing the use of multi-stage pumps. These two pumps are spoken of as high-lift centrifugal pumps and high-lift turbine pumps. In the latter the volute casing has been done away with and a system of vanes employed making the pump resemble a turbine, and hence its name. By a multi-stage pump is meant a pump having a succession of rotors connected in series, each rotor raising the pressure of the water by a certain amount. The same work can be done by using several separate pumps in series and many successful installations have been worked out this way. The parallel of this in the electrical industry is the employment of two or more direct-current generators in series to raise the voltage or pressure on the system.

As stated above, the single-stage, volute

pump is applicable to low heads only. There seems to be some difference of opinion in regard to the maximum head on which these pumps should be used, but as a general rule they can be applied to heads from 0 to 150 feet. Since these pumps are particularly well adapted to low heads and large volumes of water, they find their best application in irrigation, drainage, reclamation, water-works where lift is not high, pumping for filter beds, sewerage and dock work and general water service under low heads. The amount of water that can be handled is almost unlimited.

Several installations have been made which handle 130,000 gallons per minute. These pumps have discharge pipes as large as 72 inches in diameter. In one large installation there are two 66-inch pumps of the following capacities: 100,000 gallons per minute, head 8.5 feet, 100 revolutions per minute, efficiency 75 per cent; 175,000 gallons per minute, head 20 feet, 150 revolutions per minute, efficiency 85 per cent. For the drainage of the Ferrarese marshes pumps have been installed moving 2,000 tons or almost 500,000 gallons per minute. For the drainage of marshes in Barbados pumps have been installed with impellers 15 feet in diameter and with whirlpool chambers 32 feet in diameter. In the Lake Superior Paper Company's new plant there are two volute pumps, each handling 6,000,000 gallons of pulp per day. These are the largest pulp pumps in existence.

Fig. 4. Small Turbine Pump Used on Hydraulic Elevator System.

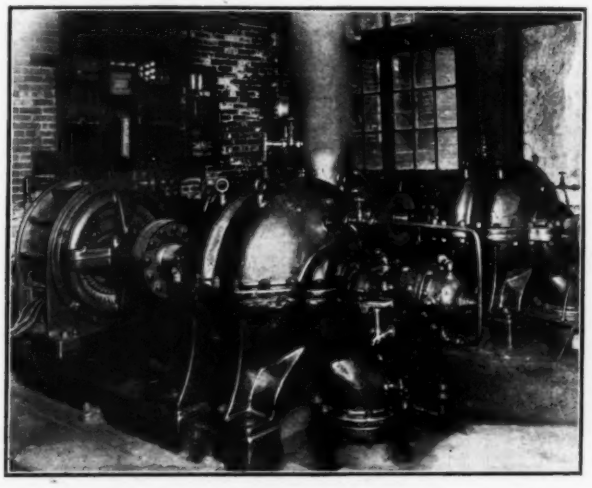

Fig. 5. Two 12-Inch Volute Pumps Driven by 150-Horsepower Motors.

High-lift pumps are, as stated above, divided into two classes: high-lift centrifugal pumps and high-lift turbine pumps. The only difference between these two types is that the former has no diffusion vanes, while the latter has. Both of these types employ the use of multi-stages. The high-lift centrifugal pump is merely a succession of volute pumps in series, with the volute casing only on the last stage, while in the turbine pump, the diffusion vanes are used in each stage.

There is a difference of opinion among manufacturers in regard to the use of diffusion vanes on multi-stage pumps. Until recently practically all high-lift pumps were equipped with stationary diffusion vanes, but now there seems to be a tendency to build pumps without them. The whole question resolves itself into one of efficiency. In regard to the question, one writer, in the preface to his book, states that pumps without diffusion vanes will not be considered, since their efficiency is below what can be obtained with vanes. The basis of this argument was that with the continued use of centrifugal pumps there would follow a demand for higher efficiency, and that this demand can only be met by using diffusion vanes. It must be remembered that diffusion vanes are stationary guides, similar to the vanes in the impeller, placed in the casing to direct the path of the water as it leaves the tips of the impeller. The shape or curvature given these vanes is, of course, dependent upon the velocity of the water leaving the impeller. It would naturally follow that where the velocity of the water is changed the effect produced by the vanes would be entirely different. For this reason certain pump manufacturers have discarded the use of vanes and have turned their attention to the volute-shaped casing, claiming that the results obtained tend to improve efficiency. There is no doubt about the fact that a pump fitted with vanes is more difficult to construct and is therefore more expensive, but for a certain specified head and velocity they should give the higher efficiency. However, with the increasing use of centrifugal pumps a more wide use of variable speed will result and the pump with the flatter efficiency curve over wide ranges in speed will be desirable. We might say, then, that for absolutely constant speed the turbine pump will be the more efficient, but for variable speed the pump without fixed guide vanes will be desirable.

In standard high-lift pumps the head per stage varies, depending upon the amount of liquid handled. Good practice seems to place the head per stage between 100 and 150 feet. The limiting factors in head per stage are friction losses due to high velocity with a small number of stages and the deterioration of the vanes and the impeller and diffusion tips due to contact with water.

Among the many applications of multi-stage pumps are found, lifting water out deep mines, water for hydraulic elevators, fire-pump service, hydraulic mining, water works having high heads and large power-station work.

As stated under the head of low-lift pumps, the volute pump is essentially a slow-speed pump. To handle large quantities of water against low heads with high speeds, two types of pumps have been designed; screw, or propeller pumps, and multi-rotor pumps.

The screw, or propeller pump is really not a centrifugal pump, so little discussion will be given to it. In a few words, it consists of a screw or propeller similar to the disk fan. "The water flows axially into the propeller, is given a radial motion and is discharged axially into a vortex or volute chamber. In the centrifugal pump the liquid flows in a radial direction through the impeller and obtains its energy through the difference in circumferential speed at the inlet and outlet of the impeller." In a screw propeller pump the liquid flows axially, with no increase in circumferential speed, and obtains its energy through impulses from the propeller. After leaving the propeller the water can be guided to the discharge pipes by vanes or by a volute casing.

The multi-rotor pump merely consists of a pump made up of more than one impeller, of the standard centrifugal pump, operating in multiple in one casing. On entering the casing the water divides, part going through each impeller and coming together again at the discharge

end. This pump does the work of two or more single-stage pumps, operating in multiple.

The most common condition under which a centrifugal pump operates is, in all probability, constant speed. In all probability, practically 90 per cent of the pumps installed are designed to operate at a constant speed, with very little variation in head worked against and volume delivered. In considering the pump under these conditions, reference will be made to Figs. 6 and 7. Here we have the general operating characteristics of centrifugal pumps, all factors being expressed in per cent of normal. We are more or less familiar with the general shape of these curves, but there are several points of interest to be noted. Both sets of curves show the general laws of centrifugal pumps; that the capacity or volume delivered is in inverse proportion to the head worked aaginst; that as the head increases, the capacity and horsepower required decreases (in this condition consider the contrast with the reciprocating pump), and that unless the driving power is sufficiently large there is a possibility of overloading the motor when the head gets below normal. In this connection it should be noted that recent designs in pumps have almost made this condition impossible when the pump is driven by a driver of liberal design. In Fig. 6 the maximum rise in brake horsepower is only five per cent above normal, and this occurs with a 35 per cent increase in capacity, with a 50 per cent drop in head. This design is very desirable where there is a probability of the pump "losing its head." In Fig. 7 the maximum rise in brake horsepower is 27 per cent above normal, with a 50 per cent increase in capacity and a 50 per cent decrease in head.

These two sets of curves show two different designs of pumps, one with the drooping characteristic head-capacity curve, Fig. 6, and one with the rising characteristic head-capacity curve, Fig. 7. For varying head work the pump should naturally have the drooping characteristic so as to give a high efficiency over as large a range of head as possible. For service where a variation in capacity is desirable the pump with the rising characteristic would have an advantage of obtaining this variation with very little change in head and efficiency.

We have seen that with a certain speed and a fixed head the pump can deliver only a fixed amount of water. Now, suppose, having assumed a condition of constant speed, we should desire to decrease the amount of water delivered. To accomplish this we must increase the head worked against, by throttling the discharge. This operation, however, is not conducive to economy, since throttling causes shocks and eddies in the pump casing, which results in decreased efficiency.

In this connection the likeness of the centrifugal pump to the water turbine has suggested a possible way of varying the volume delivered at constant speed; that is, by the use of adjustable guide vanes around the impeller. The vanes would vary the cross section of the guide channels, thus throttling the water, and change the direction of flow, thus keeping up a relatively high efficiency. This has not been practical on high-pressure pumps because the cross sections are small and the movable vanes would be difficult to install. One writer says the following: "The only reason why they have not been adopted on low-head pumps (where the channels are sufficiently large) is on account of the greater cost of construction. Commercially it is difficult to have a costly pump competing with cheaper types, even if the former possesses some advantages, and especially when guaranteed efficiencies at normal load are the same. But with the constantly increasing use of centrifugal pumps there will be many demands for a high efficiency. Should such high efficiency be demanded with varying quantities of water, adjustable guide vanes must come into use in spite of the higher costs. This applies more especially to low-pressure pumps."

The most economical way to vary the amount of discharge from a centrifugal pump is to vary its speed. This method is used in all installations of good design where such variation is possible. In Fig. 8 is seen the effect of this change in speed. This illustration shows how the efficiency curve is flattened out. Fig. 9 shows the head-capacity curves for five different speeds of a volute pump with interposed efficiency curves. The efficiency curves are drawn by connecting together the points of equal efficiency at different speeds and show what a large range in capacity can be obtained with good efficiency. It, therefore, follows that where variable capacity is desirable, it can only be accomplished efficiently by varying the speed. However, care should be exercised in the selection of the size of motor to be used on the pump since there is a great danger of overloading the motor as the speed is increased. In Fig. 8 it should be noted that the dotted brake-horsepower curve rises very rapidly.

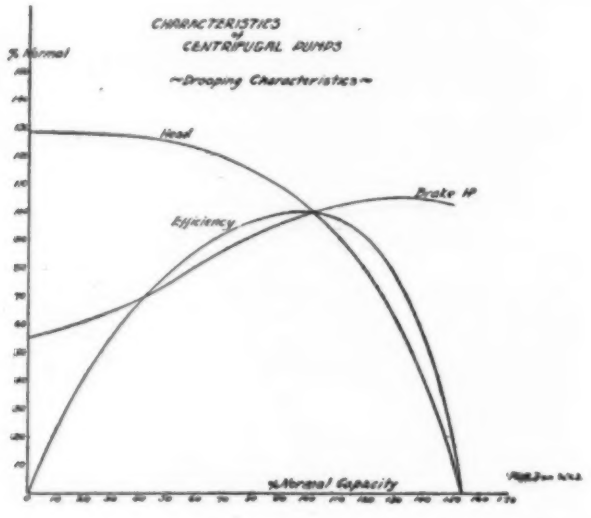

Fig. 6. Drooping Characteristics of Centrifugal Pumps.

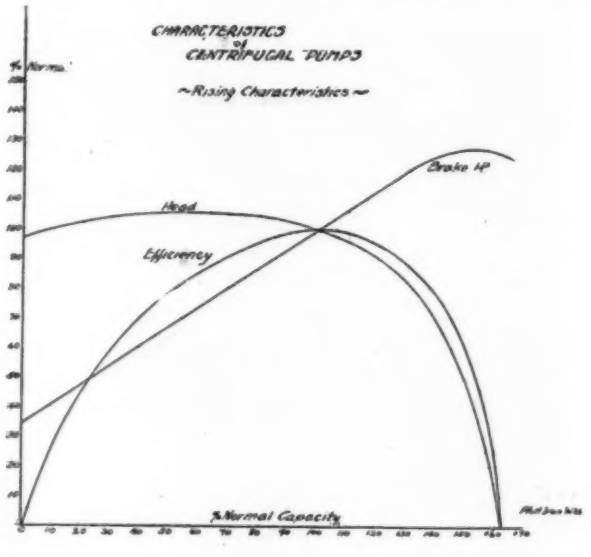

Fig. 7. Rising Characteristics of Centrifugal Pumps.

Some one has made the following statements about centrifugal pumps and it would be well to remember them:

"With constant head the capacity will vary as the square of the speed.

"With constant speed the capacity will vary inversely as the square of the head.

"The head is proportional to the square of the speed, the volume being proportional to the speed."

These statements are theoretically true, but if they are remembered a large amount of trouble can be eliminated in

connection with the working out of centrifugal-pump problems.

In studying centrifugal pumps from the standpoint of the central station the following points should be considered:

First, the careful determination of the head to be worked against; second, the priming conditions; third, the design and efficiency of the pump; fourth, the selection of the driving motor.

The head on centrifugal pumps is made up as follows: Suction lift, discharge head, friction head and the velocity head. The suction lift is the vertical distance from level of water to be pumped to the center line of the pump, as illustrated in Fig. 10. The discharge head is the vertical distance from the center line of the pump to the level to which the water is to be elevated. To determine this very accurately where the pumping is now being done by another type of pump, it is best to place a pressure gauge on the discharge from the pump and convert the pressure reading to feet elevation. The friction head can be determined from tables giving losses in pipe lines, and elbows for different sizes and capacities. The velocity head is dependent upon the velocity of the water and can be accurately calculated. It is very important that all of these factors be calculated as accurately as possible or the pump will not be suitable for the operating conditions and will operate at a low efficiency.

One of the primary considerations in a centrifugal pump is that its water passage must be completely filled before it will operate. Therefore, before starting up the pump it must be primed. This is therefore a prerequisite to its operation. The simplest and safest way to insure priming is to place the pump in such a position that it will be primed at all times, by placing it a few feet below the level of the water to be pumped. Although the pumps will operate under a suction lift, yet it is always best to have the water flow to the pump. This condition is almost essential where the liquid to be pumped has a vapor, such as drains in boiler rooms to be handled by a sump pump. In this case a vertical submerged pump would be the most satisfactory.

In some cases the pump cannot be placed below the level of the water and must therefore have a suction lift. This lift should be made as small as possible and the lower end of the suction pipe should be submerged almost to the bottom of the tank, and a foot valve placed on it. This valve will prevent a backward flow of water into the tank when the pump is shut down, and if it is kept in good condition, the pump will always remain primed.

Where neither of the above conditions can be met there are several other methods that can be used, which we might call artificial methods. A small hand pump can be used to get sufficient water to fill the passages of the centrifugal pump, an injector can be used, or a small tank can be placed above the pump with capacity enough to fill the pump passages. Of course, any method that requires the least amount of labor will give the best results and every installation should be studied carefully under the first condition of priming.

The design and efficiency of the pump and the selection of the driving motor can best be discussed under one head, since the latter is in a way dependent upon the former. As we have seen, the highest efficiency is attained at high speed. This is also true of electric motors. Therefore, the combination of the two by direct connection would result in the most economical drive. Care should be taken in the question of speed. In many cases the variation in speed of the alternating-current motor due to a change in frequency should be considered. Where an accurate determination of the capacity to be delivered and the head to be worked against is essential, the slip of the motor and the change in speed due to frequency must be noted. A 10 per cent variation in speed one way or the other from that at which the pump is designed to operate will make a large variation in the work the pump will do. The speed regulation of the direct-current motor is also of importance, but not as essential as in the alternating-current motor. If a slight error in the calculation has been made the speed of the standard direct-current motor can be very easily changed to suit the conditions by the use of resistance, but with the squirrel-cage alternating-current motor this is not possible. Fig. 9 illustrates the effect a 10 per cent speed range can have on the pump. Suppose the pump to be designed for operation at 1,000 revolutions per minute against a head of 95 feet, delivering 1,100 gallons per minute. At a 10 per cent drop in speed the pump would stop delivering, since the maximum head at 900 revolutions per minute is only 86 feet, and then delivering only 500 gallons per minute. A 10 per cent increase in speed would cause the pump to deliver about 1,570 gallons per minute. The brake-horsepower curve of the pump should be noted and a motor chosen of sufficient size to be able to take care of the load in case of a break in the discharge line. The present design of pumps practically eliminates the possibility of any trouble from this source, but it would be well to ascertain the power required by the pump at zero head.

Besides the points discussed above there are several others that will come up during the consideration of a particular problem. These points are confined solely to the construction of the pump and will

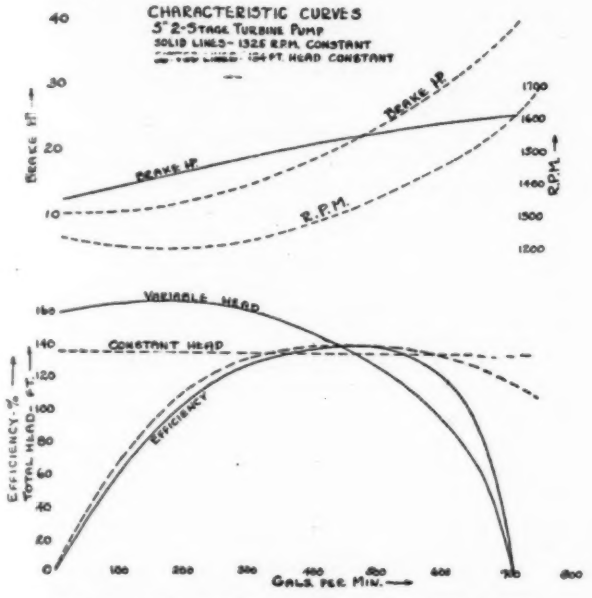

Fig. 8. Characteristic Curves of Five-Inch Pump.

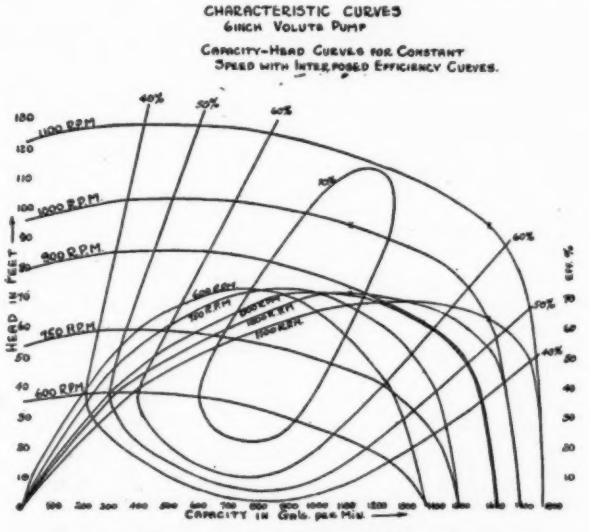

Fig. 9. Characteristic Curves of Six-Inch Pump.

make themselves known under actual operation. They cover such facts as open and inclosed impellers, solid or horizontally split casings, materials used in parts in contact with water and the method of drive.

In regard to open or inclosed impellers, where a high efficiency is desired there is no need for hesitation, for the inclosed impeller must necessarily be used. With the open impeller there is a considerable loss through leakage from the side of the vanes which greatly reduces the efficiency of the pump. The pump equipped with the open impeller is, of course, the cheaper proposition, but it is a question as to whether this type of impeller should be used under any circumstances.

The decision in regard to solid or horizontally split casings is of somewhat the same character as the one just mentioned, concerning the impellers. Where the pump has a solid casing, it can be easily seen that in order to do any repair work on the impeller the whole pump must be taken apart and the suction and discharge pipes removed. In the other pump the casing is split horizontally and all moving parts, together with the suction and discharge openings are in the lower half. In order to repair the pump the upper casing only is removed and the impeller can be lifted out without disturbing any of the permanent connections.

For ordinary water service the impeller should be made of bronze, and the interior of the casing and the shaft where it comes in contact with the water should be bronze covered. This does away with all trouble due to corrosion. For handling brine in refrigerating plants, some pump manufacturers furnish iron parts and some furnish bronze parts.

In regard to the type of drive the pump may be belted or direct-connected to its source of power. Of course, direct-connection is the more satisfactory and where this is adopted, some form of flexible coupling should be used.

Since the centrifugal pump is best adapted to electric motor drive, there would be cases where its advantages could be named among the advantages of motor drive. If a large pumping plant was under consideration the possibility of the central station getting the business would depend, besides upon the advantages of saving that could be shown by the use of motors, upon the points that could be brought up in favor of the centrifugal pump, since were the reciprocating pump decided upon, steam would be the source of power. We might say then, that in many cases advantages in favor of the centrifugal pump would be advantages in favor of motor drive.

The more important advantages of the centrifugal pump when compared to the reciprocating type are simple in construction, absence of valves, large water passages, low first cost, and furnishes water stream without shock.

The first three advantages named will have their greatest effect after several years of service. With the reciprocating pump there is always a falling off in efficiency after a few years of operation. Due to the fact that wear of valves and pistons is always present in reciprocating pumps, there is always a great amount of slippage present. The centrifugal pump will continue to operate at an efficiency practically equal to that found at the time of its installation. Although this initial efficiency may not be as high as that found in reciprocating pumps, yet when slippage and wear of valves is taken into consideration, and the cost of maintenance included the advantage will be on the side of the centrifugal pump.

The great adaptability to motor drive by direct connection renders it possible to place the pump directly where the pumping is needed, without the losses incident to long lines of steam piping in cases where the boiler is at some distant point.

The pump offers another advantage in the ease by which it can be automatically controlled when motor driven. Practically no power is required to start the pump.

The reciprocating pump with its piston motion produces a pulsating pressure in the discharge lines. On account of this fact, air chambers and relief valves are always necessary to relieve the pipe lines from sudden fluctuations in pressure, where this type of pump is used. The centrifugal pump delivers a steady stream of liquid at a constant pressure, free from any tendencies to cause shocks and water hammers. In many instances this fact will be found to result in a great advantage in favor of the pump in question.

In city pumping stations where the available space is small the centrifugal pump would be the only satisfactory solution. Where such installations could be driven from central-station power, the investment for boilers and other auxiliary equipment would be eliminated. The building, under these conditions, could be smaller and the necessary attendance reduced at least one-half.

We can therefore feel that, with its many advantages, with the continued increase in efficiency and with the more widespread knowledge of its characteristics the centrifugal pump will be free from its bondage of mystery, and will float on steadily through the industrial field, driven by electric motors, consuming their share of central-station electric power.

In the preparation of this article reference has been made and credit hereby given to "Centrifugal Pumping Machinery," by Carl De Laval, "Centrifugal Pumps, Their Design and Construction," by Loewenstein and Crissey, and publications of the De Laval Steam Turbine Company, Platt Iron Works and Alberger Pump & Condenser Company.

Dayton Power and Light Company Picnic.

The seventh annual picnic of the employees of the Dayton Power and Light Company was held at Kil Kare Park, about 12 miles from Dayton, on Tuesday, June 22, 1915.

The picnickers went to the park in the traction cars of the Dayton, Springfield & Xenia Southern Traction Company, which is operated with current from the Dayton Power and Light Company.

In the morning a baseball game was played between the different office departments and the outside departments, which resulted in a victory for the outside departments, and they became the possessors, for the first year, of the "F. M. Tait Cup," which was donated by Mr. Tait for annual competition in baseball between these two divisions of the company.

Following the dinner, the annual photograph of the company was taken, in which appeared 768 people, made up of the employees and their families. It is interesting to note here that in 1914 approximately 525 attended the picnic —which goes to show the growth of the company during the past year.

Following the taking of the photograph, John Himes, head of the meter department, on behalf of all of the employees, presented to Mr. Tait, president and general manager of the company, a solid gold watch, on the eve of his leaving Dayton to take up his residence in New York City.

The afternoon was given over to athletic events of all descriptions, such as indoor baseball, volley ball, foot polo, three-legged race, sack race, handline throwing, tug-of-war, potato race, quoits, tennis, boating and bathing. All of these events were keenly contested for, not only for individual prizes, but for points to determine the possessors of the "Young Cup," which was donated by the late A. M. Young, for annual competition between the different company departments in athletic events.

The cup this year will be in the possession of the maintenance and construction department, and the Sterling silver medal, given to the best all-around athlete on the grounds, was presented to Richard Pflaum, of the maintenance and construction department.

Following the evening meal the different prizes were presented to the winners and the evening was spent in dancing.

The athletic committee was composed of M. H. Wagner, chairman; Miss Hughes, C. P. Garman, R. R. Herkins, O. E. Howland, O. B. Reemelin, F. B. Steele, R. L. Stewart and H. Thompson.

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THE ELECTRIC-FURNACE LOAD AS A CENTRAL-STATION POSSIBILITY.

Details of a California Installation.

Those who have made a careful study of the trend of central-station activities predict that industrial electric heating will ultimately develop into a most important field for new business. Already notable progress has been made as is evidenced by the contract recently secured by the Toledo Railways & Light Company from the Willys-Overland Company, calling for an installation of 6,000 kilowatts in enameling ovens. The success of this installation, from every standpoint, opens up unlimited possibilities in the automobile industry alone, and important research work is being carried on by central stations in the automobile producing centers, with a view to the general introduction of electric heating.

The electric furnace, particularly, offers an interesting study and gives promise of a wide field of usefulness. At the recent convention of the National Electric Light Association at San Francisco, W. M. McKnight presented the following data on an interesting furnace installation in California.

In the advancement of the application of electrical energy to new purposes the electrical furnace offers an interesting study and gives promise of a wide field of usefulness. Late installations show a marked improvement over the somewhat crude devices of earlier periods, demonstrating high efficiency and merit.

The Warman Steel Casting Company of Redondo, Cal., originally used Milwaukee-type crucible furnaces and California crude oil. Crucibles were limited to units of 150-pound capacity and there was uncertainty as to whether large castings could be poured successfully. The total output of the foundry was three tons per day. The high cost of crucibles on the Pacific Coast, their short life and the labor expense in handling them was a serious factor in establishing the success of the undertaking.

In November, 1913, an electric furnace was installed. This was the first Stassano arc furnace used in the United States, and it has been operated continuously from that time, except at intervals necessary for relining. Its capacity is one ton and six heats can be run daily. Deducting for loss of time in relining, there are 24 full operating days per month at 24 hours per day.

The furnace is lined with magnesite brick, which is such a good heat insulator that even an interruption of four hours will not cause the molten metal to chill and crystallize, with the consequent loss of a furnace lining. It requires two days for the relining, three times a month, and the best magnesite bricks are used. The cost of relining is $225, including labor and material, no cement being used between bricks, as they are of such shape as to leave practically no crevices.

Steel castings ranging from the smallest to 1,600 pounds are being founded and sold for from 20 cents per pound to 6 cents per pound, according to size. At present automobile fittings, gears, propellers, rocker arms, water-wheel buckets, and such castings as must be relied upon for the greatest strength are being founded.

The distinguishing feature of this furnace is that fusion is by radiant heat from an electric arc from 2 to 3 inches above the metal and approximately 24 inches from the roof of the furnace, in a closed chamber with neutral atmosphere for the chemical reactions which take place in the process of refining. This permits of closer accuracy and thoroughness in making castings according to specifications. The furnace combines the well-known features of a completely closed melting chamber, the arrangement of a three-phase electric arc above the metal preventing the carbon and other electrode impurities from entering the metal and allows a thorough mixing during any desired length of time. The metal reaches a temperature of approximately 3,600 degrees Fahrenheit, before being poured.

The furnace is suspended on trunnions in a horizontal steel ring, which in turn swings by means of another pair of trunnions, supported in the same plane about 90 degrees around from the first pair, similar to the mounting of a ship's compass.

It is tilted, for the purpose of skimming the slag and pouring the metal, by means of a geared connection on the bottom, controlled by a hand wheel. This unique suspension places the furnace attachments above the plane of the trunnions. The three electrodes dip toward the center of the furnace at an angle of about 15 degrees, converging to a point from 2 to 3 inches above the metal. The average arc is about 10 inches, although at times an 18-inch arc is drawn.

While the original furnace was closed at the top, the Warman Company has altered it so that the roof is removable, and additional furnaces to be installed shortly will embody this improvement.

The carbon electrodes are 3.5 inches in diameter and 6 feet long and burn down to stubs about 18 inches long. The electrodes enter the furnace through a water jacket and are fed individually by hydraulic pressure regulated from control valves at an operator's stand. The consumption of water from the city main is almost nil, amounting to about $3 per month, the water being circulated by a two-horsepower motor-driven pump through a cooling tower to a tank, which supplies the water jackets and the hydraulic control under a head of 20 feet.

The current consumption of the furnace is from 800 to 2,000 amperes per terminal on a three-phase 150-volt circuit. Current is supplied through flexible cables connected to a marble switch panel supporting three single-pole double-throw and one three-pole double-throw knife switches of heavy construction, connecting transformer secondaries in either inter-connected star or delta, at pressure of 150 volts and 100 volts, respectively, with the furnace. Standard indicating instruments are in use. To keep the balance, a ground connection is tapped through an oil switch and overload release, to the middle point of the Y on the main circuit.

Heavy copper busbars lead from the switches to the secondary terminals of three 100-kilovolt-ampere transformers which are specially designed, oil-cooled and wound for 10,000 volts primary and 110 to 150 volts secondary.

The entire consumption for the installation is registered by a primary meter, which together with the transformers is placed in a galvanized-iron substation and controlled by a 10,000-

volt Kelman oil switch with overload trip coils. The 10,000-volt service to the plant is protected at the pole by a fused pole-top switch operated from the ground. The plant is served from a double circuit 10,000-volt transmission line one-quarter mile distant. Provision is made, in case of emergency, to connect to either transmission line circuit through a pole-top switch. The double transmission line is fed from two nearby substations, each having an approximate capacity of 2,000 kilowatts. These substations are supplied from the Southern California Edison Company's 10,000-volt and 33,000-volt transmission lines.

Heretofore scrap steel has been a drug on the market in Southern California, the majority of it being shipped East, and this industry has the advantage at present of an unlimited supply of the best scrap steel, at from $7 to $10 per ton.

Aside from steel, ferro-silicon, ferro-manganese and anthracite coal having 90 per cent of fixed carbon, are ingredients necessary to the finished product.

There is very little variation in load from day to day, the average demand being about 225 kilowatts. The fluctuation of the load, which is non-inductive, scarcely affects the regulation of the 10,000-volt line.

Electrical experts, and particularly those engaged in the commercial branches of the business, believe that this installation has established the value and merit of the electric furnace and placed it beyond the experimental stages, and that it must now be regarded as one of the great current-consuming commodities.

Boston Edison Company Employees' Outing.

The annual field day for the employees of the Edison Electric Illuminating Company of Boston was held June 26, at the Riverside Recreation Grounds, 4,500 attending.

The program consisted of 40 sporting events, with prizes for all winners. There was a tennis match between the Boston Y. M. C. A. and Edison tournament winners; a baseball game between the Boston Woven Hose & Rubber Company team and the Edisons; track events and joke sports. Throughout the day two clowns moved about among the crowd, producing great merriment. The Waltham Watch Company band played all day. Luncheon was served to all at the noon hour.

The occasion was in charge of the Welfare Bureau, of which H. W. Moses is the head. Assisting him were W. H. Carrasco, J. J. Buckley, O. B. Landon, C. E. Greenwood, G. H. Atwood, T. Collins, J. W. Emmons, G. M. Guilford and Dr. W. T. Bailey.

SUCCESSFUL COMMERCIAL MANAGERS.

Clare N. Stannard.

Denver, "The City of Lights," is so termed because of its extensive street, sign and decorative lighting and because the number of lamps so used, per capita, is not exceeded in any city in the country. However, the lighting is but one manifestation of the degree of electrical development in Denver, although to the layman the most effective.

Aside from its somewhat remarkable record of business secured during the past 15 years, the Denver Gas & Electric Light Company is known throughout the industry for its progressiveness,

C. N. Stannard.

particularly in regard to its commercial policies and its relations with the public.

It is a tribute to the ability of Clare N. Stannard, secretary and commercial manager of the company, that considerable of this development dates from the time of his assumption of the duties of commercial manager of the company.

Mr. Stannard entered the gas and electric business in 1890 with the Binghamton Gas & Electric Company, of Binghamton, N. Y., taking a cadet course with that company covering a number of years, working in all departments of the gas, electrical and street railway divisions, thus securing information first hand in the operating, manufacturing, distributing and office departments. In 1897 he entered the employ of the Denver City Tramway Company in the auditing department, the following year accepting a position with the Denver Consolidated Electric Company. In the year 1899 a consolidation occurred between the Denver Consolidated Electric and the Denver Consolidated Gas Company and the Denver Gas & Electric Company was formed. Mr. Stannard assumed the position of cashier of the new company and shortly thereafter became superintendent of distribution, later on being made commercial manager and secretary of the Denver Gas & Electric Light Company, which position he now holds.

Many noteworthy campaigns for new business have been conducted under the direction of Mr. Stannard and as a result the company has wonderfully increased its revenue. At the time the new-business department was organized 1,500 ranges had been sold. Up to the present time in the neighborhood of 40,000 have been sold. There were no electric irons or other devices in the city at that time and thus far about 40,000 have been sold.

In the matter of signs and decorative flat-rate lighting, Denver is spoken of as the "City of Lights" and on a per capita basis ranks very high, in fact about as high as any city in the United States similarly located.

Equally impressive has been the growth of the power business which is now many times what it was a few years ago.

The company owns and operates 30 electric trucks, maintains an electric-vehicle department and advises with consumers relative to the purchase and operation of electric machines, both passenger and commercial. There is also a large number of passenger machines in operation in the city and the company has developed a splendid revenue from charging both classes of vehicles.

Recently a spring appliance campaign was completed resulting in a gratifying addition to the company's business.

It is the policy of the Denver Gas & Electric Light Company through its commercial department to co-operate with all classes of consumers, advising with them as to best ways and means of obtaining the desired results with lighting, power, signs, industrial fuel, electric vehicles and other classes of business and this policy originated by Mr. Stannard has had an incalculable influence in furthering friendly relations with the public and substantially increasing the business of the company.

Increase at Minneapolis.

The sales department of the Minneapolis General Electric Company during the week ending June 11, secured contracts for 312 electric customers with 219 kilowatts lighting load and 176 horsepower in motors, and took orders for wiring 39 houses.

Timely Window Display of New York Edison Company.

An attractive window display for the week, in which Flag Day occurred, was arranged by the New York Edison Company for its various showrooms in New York City. The display was arranged in two parts, the first being a large painting of Betsy Ross and her assistants making the first American flag. Under this picture was the caption, "One in Many Days." At the opposite side of the window was a motor-driven sewing machine making flags at high speed, and here was displayed the caption "Many in One Day."

Window Display of New York Edison Company.

The Edison Company has adopted a rather unusual method of securing ideas for window displays for special occasions. Announcement is made a few weeks before Decoration Day, Flag Day, the Fourth of July, etc., that a window display contest has been arranged and every one of the 5,000 employees of the company are asked to submit suggestions. For the best suggestion a prize of $10 is awarded, while the suggestions receiving second and third choice are given honorary mention and published in the Company's employees' publication.

Free Service to the Needy.

The Louisville Gas & Electric Company, which last year supplied free fan service to the indigent sick in Louisville at the written request of the attending physician, or any physician, has gone further this summer and is including in the service the use of an electric toaster which is furnished as well as the fan. The conditions are set forth in some 700 letters which have been mailed out to the 700 doctors of Louisville, which contain the following explanation of the toaster proviso:

"Toast well prepared is a necessary article of diet to nearly all invalids. In many cases it is difficult to prepare toast properly and serve it in an appetizing condition with the ordinary cooking facilities. An electric toaster, therefore, will be appreciated in every sickroom, almost as much as an electric fan."

The company makes temporary connections where none exist, though houses which can be served must be located on existing lines of the company.

The element of new-business getting, paradoxical as it might seem, enters into this charitable service, although there is no thought of a profit, other than good will on the part of the company's management. But last summer, having had a taste of electric service, an occasional recipient, when restored to health and earnings again, bought a fan and installed it, and there were several instances of charity cases when the breadwinners got back to work and better times came, becoming subscribers to regular service of the company and having their houses wired.

Special Lighting at Maine Fair.

Noteworthy lighting features for the Maine State Exposition, which opened at Portland June 7, were provided through the Cumberland Power & Light Company of that city.

The exterior of the large exposition building, specially built for the occasion, is illuminated with spectacular floor lighting by means of four projectors of the same type as those used at the Panama-Pacific Exposition and designed by the General Electric Company.

The projectors consist of a polished aluminum parabolic reflector 16 inches in diameter mounted on an iron frame. The front is covered with curved heat-resisting glass clamped to the reflector frame and packed so that the unit can be operated out of doors.

The projectors are each operated with a 500-watt high-efficiency Mazda lamp. The beam may be concentrated to about six degrees divergence, with an apparent candlepower in the center of about 400,000 by locating the filament exactly at the center. By drawing the filament behind the focus, the beam may be spaced to 18 degrees, with an apparent candlepower of 150,000 in the center of beam.

Each projector is mounted about 150 feet from the building and focused at a different angle. The effect is imposing, revealing the simple yet dignified outlines of the building.

Interior lighting is with 750 and 500-watt gas-filled units, in the central area, and 300-watt units of the same type under the galleries.

New Business at Louisville.

The commercial department of the Louisville Gas & Electric Company during the week ending June 11 secured contracts for 131 customers with 82 kilowatts lighting load and 26 horsepower in motors and took orders for wiring 24 already built houses. The city issued 103 electric wiring permits during the week.

Electrical Construction

ELECTRICAL CONSTRUCTION IN MACHINE SHOPS AND FOUNDRIES.

By Norman G. Meade.

There are few industrial establishments where the service conditions of the electrical equipment are more severe than in machine shops and foundries, and in the various departments that go to make up a plant of this kind. In the foundry especially, the prevalence of fumes and gases rapidly deteriorates open wiring and accessories. In both machine shops and foundries, traveling cranes, jib cranes and portable machinery are a constant menace to exposed wiring, and conduit work is by far the best investment when depreciation and repairs are considered. In laying out a wiring installation provision should be made for numerous outlets to receive portable-light plugs, connectors for portable motors, etc. As far as practicable, all lighting circuits should be controlled from centers of distribution so that an authorized employee will be responsible for the lighting and extinguishing of all lamps.

Power circuits should, as far as expedient, be run independently of the lighting circuits. For direct-current motor circuits the underwriters require at least 25 per cent greater capacity than the motor calls for, to take care of overloads and starting current. Calculations for wiring are based on the following formula:

$A=P\times746\times22\times1.25L/eE\eta$, in which

A=Area of conductor in circular mils,
P=horsepower,
L=length of one conductor in feet,
E=voltage of circuit,
e=drop in volts,
η=efficiency, which may be taken as 80 per cent.

For alternating-current circuits,

$A=P\times746\times22\times1.5L/eEf\eta$, in which

A=circular mils,
L=length of one conductor in feet,
η=efficiency of motor,
f=power-factor of motor,
E=voltage of circuit,
e=drop in voltage.

This applies to single-phase, to four-wire two-phase and to three-wire three-phase circuits.

The above formula takes into consideration the starting current and overload requirements.

Figs. 1, 2, 3 and 4 give the horsepower requirements for several types of machine tools. These data are based on a large number of tests and excerpts from standard practice and represent fair averages for machines with one cutting tool. Where high-speed tool steel is to be used the power should be increased from 2.5 to 3 times. It will be realized that there

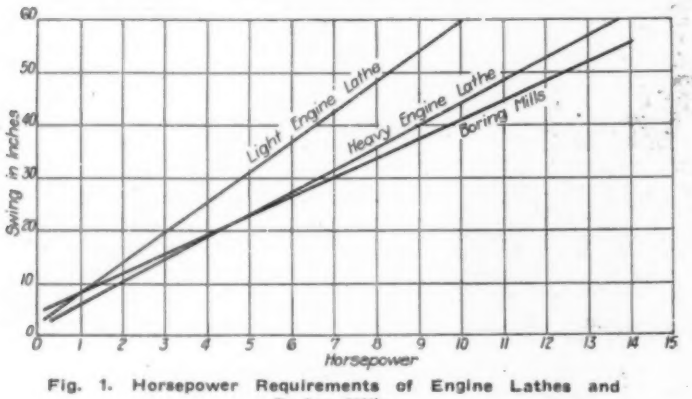


Fig. 1. Horsepower Requirements of Engine Lathes and Boring Mills.

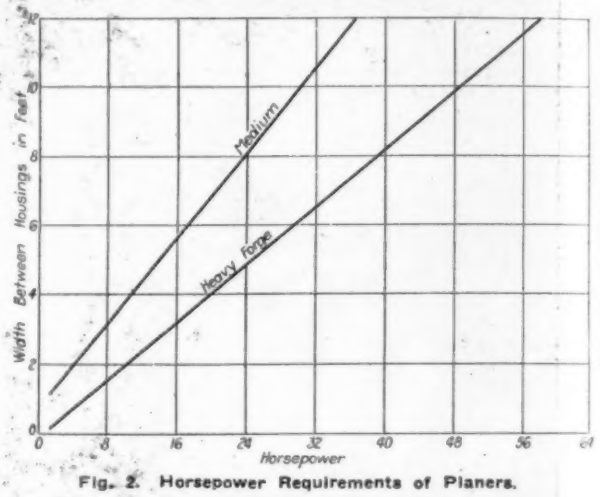


Fig. 2. Horsepower Requirements of Planers.

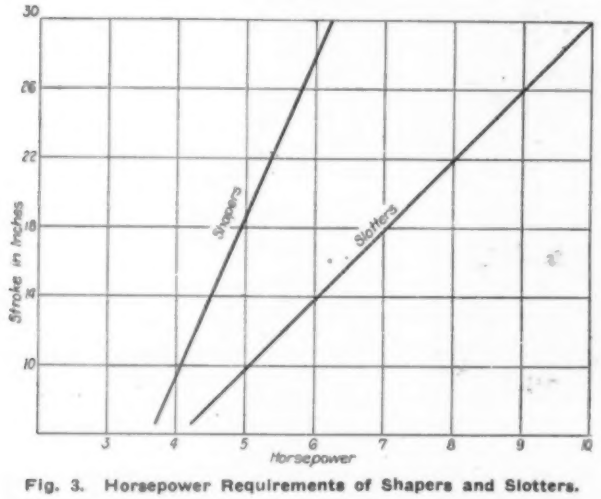


Fig. 3. Horsepower Requirements of Shapers and Slotters.

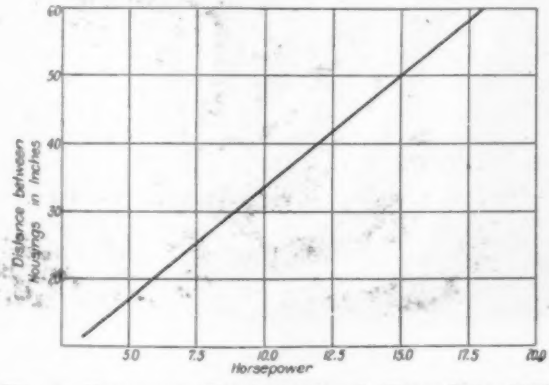


Fig. 4. Horsepower Requirements of Planer-Type Milling Machines.

TABLE I.—CUPOLA BLOWERS.

Diameter inside lining, inches.	Capacity per hour, tons.	Pressure per square inch, ounces.	Volume of air, per minute, cubic feet.	Horsepower.
18	0.25-0.5	5-7	150- 300	0.5-1.5
24	1-1.5	7-9	600- 900	2-6
30	2-3.5	8-11	1,200- 2,000	5-15
36	4-5	8-12	2,200- 2,800	10-23
42	5-7	8-13	2,700- 3,700	12-32
48	8-10	8-13	4,000- 5,000	18-45
54	9-12	9-14	4,500- 6,000	22-60
60	12-15	9-14	6,000- 7,500	30-75
66	14-18	9-15	7,000- 9,000	35-90
72	17-21	10-15	8,500-10,500	45-110
78	19-24	10-16	9,500-12,000	52-130
84	21-27	10-16	10,500-13,500	60-150

are so many conditions entering into the operation of machine tools that no exact empirical formulas for the power requirements can be deduced, but the results given in the charts should be close enough for a basis of wiring calculations.

It is beyond the province of this article to enter into a lengthy discussion of the type of equipment to be selected, but in general all machines having a rotary motion and operating at variable speeds should be driven by a direct-current variable-speed motor, preferably an auxiliary-pole type, with variation of speed produced by shunt-field resistance. Reciprocating machines, such as planers, shapers and slotters, should be driven by compound-wound direct-current motors. Types of motors and controllers are now on the market for reversing the motor at each stroke of the machine. Where both direct current and alternating current are available, induction motors are the most satisfactory for group drive and for individual drive of constant-speed machines. There is no doubt that automatic motor starters have a great advantage over manual starters as the human element, other than closing the operating switch, is eliminated.

TABLE II.—ELECTRIC TRAVELING CRANES.

Capacity in Pounds.	Span in Feet.	Hoist		Bridge		Trolley		Total Horsepower.
		Feet per Minute.	Horsepower.	Feet per Minute.	Horsepower.	Feet per Minute.	Horsepower.	
6,600	26.2	19.7	7	396	7	98	1	15
6,600	39.6	19.7	7	330	7	98	1	15
6,600	53.3	19.7	7	296	7	98	1	15
6,600	66	19.7	7	264	7	98	1	15
6,600	82.5	19.7	7	231	7	98	1	15
11,000	26.2	14.8	7	296	7	98	2	16
11,000	39.6	14.8	7	280	7	98	2	16
11,000	53.3	14.8	7	264	7	98	2	16
11,000	66	14.8	7	248	7	98	2	16
11,000	82.5	14.8	7	231	12	98	2	21
16,500	26.2	14.8	12	280	7	98	2	21
16,500	39.6	14.8	12	264	7	98	2	21
16,500	53.3	14.8	12	264	12	98	2	26
16,500	66	14.8	12	248	12	98	2	26
16,500	82.5	14.8	12	231	12	98	2	26
22,000	26.2	13.2	12	264	7	98	2.5	21.5
22,000	39.6	13.2	12	248	12	98	2.5	26.5
22,000	53.3	13.2	12	248	12	98	2.5	26.5
22,000	66	13.2	12	231	12	98	2.5	26.5
22,000	82.5	13.2	12	214	12	98	2.5	26.5
33,000	26.2	10.7	16	231	12	82.5	3	31
33,000	39.6	10.7	16	231	12	82.5	3	31
33,000	53.3	10.7	16	214	12	82.5	3	31
33,000	66	10.7	16	214	16	82.5	3	35
33,000	82.5	10.7	16	198	16	82.5	3	35
55,000	26.2	9.9	26	214	12	66	5	43
55,000	39.6	9.9	26	214	12	66	5	43
55,000	53.3	9.9	26	198	16	66	5	47
55,000	66	9.9	26	181	16	66	5	47
55,000	82.5	9.9	26	148	16	66	5	47
110,000	26.2	5.75	35	198	26	49.5	12	73
110,000	39.6	5.75	35	181	26	49.5	12	73
110,000	53.3	5.75	35	165	26	49.5	12	73
110,000	66	5.75	35	165	30	49.5	12	77
110,000	82.5	5.75	35	148	30	49.5	12	77
165,000	26.2	3.5	52	165	35	39.8	16	103
165,000	39.6	3.5	52	148	35	39.8	16	103
165,000	53.3	3.5	52	148	52	39.8	16	120
165,000	66	3.5	52	148	52	39.8	16	120
165,000	82.5	3.5	52	115	52	39.8	16	120

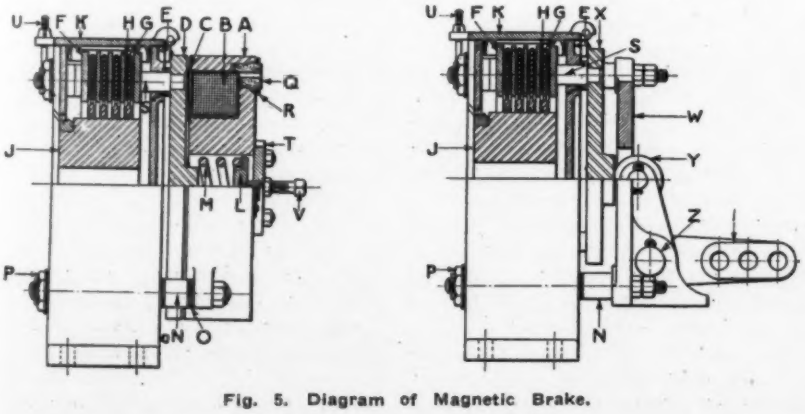


Fig. 5. Diagram of Magnetic Brake.

Horsepower requirements for cupola blowers (Kent) are given in Table I. The same authority gives the following facts about cupolas: "The actual melting range of a cupola is ordinarily between 0.6 and 0.75 ton per hour per square foot of cross-section. The limits of air supply per minute per square foot are roughly 250 to 400 cubic feet. The possible power required varies even more widely, ranging from 1.5 to 3.75 horsepower per ton per hour, for the melting rates specified. The power may be roughly calculated from the theoretical requirement of 0.27 horsepower to deliver 1,000 cubic feet per minute against a one-ounce pressure. The power increases directly with the pressure, and depends only on the efficiency of the blower." Current practice between limits is expressed in the table.

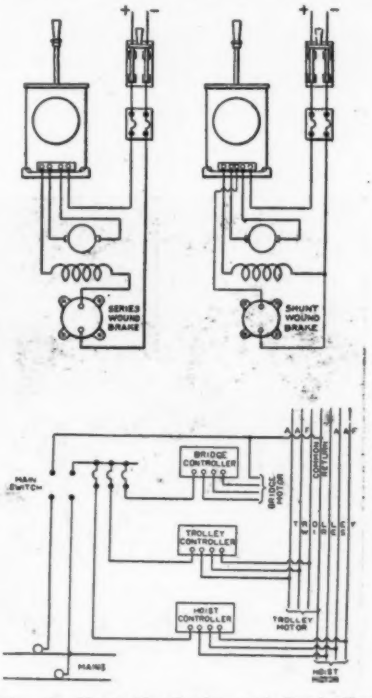


Fig. 6. Magnetic Brake and Controller Connections.

Crane Equipment.

The remarks under this section of the article are really supplementary to the article "Some Safety-First Features of Electrical Construction" which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, April 24, 1915. In Fig. 5 the details of a magnetic brake for cranes and some types of machine-tool motors are given. Fig. 6 gives the brake and controller connections and the complete

crane connections for the bridge, hoist and trolley motors and controllers. The action of the type of brake shown in Fig. 5 is controlled by an electromagnet which consists of a magnet case, coil and armature plate, and is mounted on the studs which hold the stationary friction plates. The magnet case contains the coil, the spring and the spring cup. Three spuds riveted to the armature pole, extend into the friction case and transmit the pressure of the spring to the friction plates. The magnet is generally proportioned for series connections, but may be shunt-wound when required. When the operating controller is in the off position the magnet of the brake is dead and the pressure of the spring is transmitted through the armature plate and spuds to the friction plates, so that the friction disks and the stationary plates are clamped together and the shaft is held.

For solenoid-operated brakes the selection of the solenoid is important. In any type of electromagnet in which the end of the stroke is definitely limited by the plunger striking the stationary pole, the increase in magnetic pull will be extremely rapid as the plunger approaches the end of its stroke. This accelerates rapidly all the moving parts, and when their motion is suddenly arrested by the plunger striking the stop, a heavy blow is delivered, which is liable in time to loosen bolts and nuts. Some types of magnets are on the market where the travel of the plunger may exceed the end of the coil, and are known as magnetic-cushion magnets. In these the pull increases only in desirable proportion during the stroke of the plunger. Furthermore, the plunger does not encounter a definite, sudden stop, but floats in a condition of easy equilibrium between its magnetic pull and the pull exerted on the brake. Power required to operate different capacities of electric traveling cranes are given in Table II on the preceding page.

ILLINOIS CONTRACTORS MEET AT PEORIA.

Semi-Annual Convention of Illinois Electrical Contractors Held on June 25 and 26.

The semi-annual meeting of the Electrical Contractors' Association of the State of Illinois was held at the Jefferson Hotel, Peoria, on June 25 and 26. The delegates were slow in assembling on Friday morning, due principally to the fact that a large Chicago contingent had motored to Peoria and were delayed by accidents, bad roads, and losing their way. The automobile party left Chicago on Thursday morning, stopped at Starved Rock in the afternoon and put up at Peru for the night. The next morning things became interesting. Some of the chauffeurs seemed to think that all roads led to Peoria, and every road leading out of Peru was tried by some one of the cars. G. W. Berthold succeeded in making Peoria in good time, while the others straggled in from time to time until the middle of the afternoon. Some had lost their way, some were mired, some had carburetor trouble, while Jim Kerns tried to demolish a county bridge. But they all arrived.

Group at Illinois Contractors' Convention—Left Half.

The total attendance at the convention was about 130, of whom 52 were members, and over 40 representatives of manufacturers and supply houses.

President W. J. Ball called the first session to order on Friday at 11:45 a. m. In his introductory remarks, Mr. Ball referred to the excellent work which had been accomplished by the Illinois Association in the past. The insurance scheme now in force has saved the members a great deal of money. The segregation of the electrical work from the general contract on state work has been accomplished, and has already resulted in taking work amounting of $250,000 out of the hands of the general contractor. Such things can only be accomplished by organization and co-operation. Sometimes it seems as if not very much were being accomplished by the organization, but on looking back 15 years it is seen that conditions have been vastly improved.

Representatives of the jobbers and others were then called upon for brief remarks. The following responded: Gus Harter, of Harter Manufacturing Company; W. Kearns, of Monarch Electric and Wire Company; M. G. Lloyd, of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN; E. H. Joseph, of Electric Appliance Company; A. R. Dean, of Federal Sign System (Electric); Thomas M. Endsley, of Diamond Electric Company; L. T. Block, of Utilities Indemnity Exchange; Louis Privat, of Central Electric Company; G. W. Berthold, of Electric Apparatus Company; H. L. Dollahan, of King Foundry Company; C. C. Coulter, of Electric Appliance Company; C. H. Methot, of Manhattan Electrical Supply Company.

At the session on Friday afternoon President Ball made a brief address and turned the chair over to Vice-President Marron, on account of having to leave the convention early.

Reports were made by the Board of Directors and by the secretary. The latter dealt largely with the insurance problem, and showed what a large saving had been made by the members by placing liability and casualty insurance through the Association.

The resignation of Secretary Burns was presented, Mr. Burns announcing that he had made arrangements which would prevent his giving the necessary time to the work of the office.

A resolution which was presented endorsing one-cent letter postage, was tabled.

C. E. Stapp made a report for the

Boosters Committee. A motion was passed to appoint a committee to confer with the Board of Directors on ways and means. The chairman appointed R. W. Poelma, E. E. Gibson and R. A. McLaughlin.

The remainder of the session was devoted to a discussion of the insurance problem. L. T. Block explained the workings of the Utilities Indemnity Exchange and the Chicago Association presented a report by an insurance actuary advising against reciprocal insurance.

At the session on Saturday morning the following new members were elected: George B. Marshall, Decatur; Electric Construction Company, Chicago; Alloway Electric Company, Chicago; Calumet Electric Company, Chicago.

R. W. Poelma made a report for the special committee on ways and means.

Group at Peoria Convention—Right Half.

It was decided to dispense temporarily with a paid secretary, and to continue the assessment of 0.1 per cent until finances are straightened out.

Proposed amendments to the constitution and by-laws of the National Electrical Contractors' Association were then discussed. It was voted to oppose the amendments to the constitution and to support the amendments to the by-laws.

It was voted to send a copy of the report on interinsurance presented at Friday's session to the Utilities Indemnity Exchange, St. Louis, Mo., with opportunity to answer the points brought out. The secretary is to send a copy of report and reply to each member.

The following officers were then elected for the ensuing year:

President, Norman Pierce, Chicago.

Vice-president, John Hughes, Champaign.

Secretary and treasurer, Matthew Blumenthal, Chicago.

State directors, Guy Carlton, Bloomington; L. L. Crawley, Peoria; E. F. Pendergast, Rockford.

National directors, J. T. Marron, Rock Island; F. L. Decker, Chicago; E. E. Gibson, Decatur.

The next meeting of the Association will be held in Chicago in January, 1916.

The entertainment features of the convention were well carried out. On Friday there was a supper party at Ye Olde Tavern, Prospect Heights, which commands a beautiful vista of the Illinois River and surrounding country. On Saturday evening there was a banquet at the Jefferson Hotel, the entertainment features consisting of music, dancing and elocution, to which Miss Green and Mrs. Becker contributed. The ladies were taken on automobile rides on Friday and Saturday, luncheon being served on Saturday at the I. V. Y. Club.

On Saturday afternoon a four-inning baseball game was won by the supplymen by a score of 22 to 2. The one-sided score was due to excellent battery work by Russell and Kent for the supplymen combined with four fielding and numerous errors on the part of the contractors.

Market for Electrical Goods in Portugal.

Owing to the closing of some of its usual sources of supply by the war, Portugal is in the market for electrical goods of all descriptions. Heretofore American manufacturers have not been able to compete with those of other countries, because of the much higher prices they quoted, and also because they have been unwilling to supply the relatively poor quality of equipment desired by the dealers in that country; but local stocks are being rapidly depleted, and the time seems favorable for the introduction of American goods, according to the report of the American consul at Lisbon. The matter is of more than temporary importance, and if the market is properly served future development is well worth consideration.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has samples of sockets, shade-holders, swit hes, fuses, plugs, boxes, Bergmann tubing, etc., that are commonly used in Portugal.

Cutting Out Plaster for Ceiling Outlets.

In wiring an old building much trouble is caused on account of the brittleness of old dried plaster, which crumbles away around places where outlets are to be located. Therefore, instead of forming a neat, round hole for outlets, an irregular hole is frequently left and the plaster drops in an unexpected way, making a very bad mess.

To cut plaster for ceiling outlets in such buildings, I have used this scheme. I take a ceiling plate and file teeth in the edge of it so that it looks like a small circular band saw. I break out the center knockout, and in the center hole I then fasten a piece of one-inch pipe (five or six inches long) by splitting the end and bending the sections over. I take an old brace and fasten the chuck end in the end of the pipe. I then use the outfit to cut the hole in the plaster exactly where the outlet is to be located. In the case of combination outlets, the top of the pipe centers the tool by slipping over the gas pipe. In straight electric outlets, a stout nail driven in the center of where the outlet is to be may serve to center the tool. In either case, by turning slowly the saw edge cuts a neat hole without crumbling the plaster and the plaster that drops out falls into the ceiling plate which acts like a saucer or dish to catch it.

Samuel L. Brenner.

Outfit for Making Special Conduit Bends.

While engaged in wiring the factory of the Woodward Motor Company, which installation was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 27, 1915, it was necessary to make a large number of special conduit bends to fit around the brick columns along the two sides of the building. An idea of what the proposition was is shown in Figs. 2 and 3 of the article referred to. (One of these illustrations is reproduced

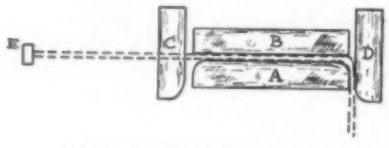


Diagram of Conduit Bend.

herewith.) These brick piers were about 24 inches wide, as I recall them, and projected from the face of the wall about six inches. The conduit between the two wall outlets on each side of the pier had to be given two double or reversed bends. To do this by hand without some means of easily locating the proper point for the bend and to make these reverse bends so close together would have been a long, tedious and laborious job.

To overcome this difficulty I rigged up a set of blocks on top of a work bench as shown in the accompanying diagram. Blocks *A* and *B* were of 4 by

Run of Conduit Around Brick Column.

4 timber nailed to the bench with a space between them of a little over one inch to admit one-inch conduit. Blocks *C* and *D* were of 2 by 4 size nailed flat. The edges of blocks *A*, *C* and *D* were rounded in the manner shown so as to form a good template for the bends. The length of *A* and the relative positions of the adjacent blocks *C* and *D* were such as to exactly suit the nature of the bends required. A little block *E* was nailed at the left at such a distance as to act as a gauge. The pipe was laid in the groove between blocks *A* and *B*, the block *E* being so placed that when the bend was completed the left end of the pipe would just come to the outlet box at one side, so as to avoid cutting the end. The right end of the pipe was then bent around as shown dotted. The pipe was then reversed so as to have the bent end between *A* and *C* and the long end projecting over *D* to the right. A bend was then made between blocks *A* and *D*. The two projecting ends of the pipe were then bent around the lower curves of blocks *C* and *D* by means of a hickey, thus completing the bends. One end of the pipe then had to be cut off about six inches to bring it to the proper position for the other wall outlet.

By this means all the bends were made very quickly and all of them were exactly alike, thus producing a very neat finished job. Several dozens of these bends had to be made and they were all finished in one afternoon. This scheme has been used by me in other buildings where similar conditions have had to be met.

Samuel L. Brenner.

Effective Advertising by Contractor.

The progressiveness and originality of the Beck Electrical Construction Company, of Minneapolis, Minn., is reflected in its advertising which has gained for the company an enviable reputation. In addition to a liberal amount of general advertising, special publicity matter is issued at frequent intervals. Recently blotters of two sizes have been prepared for distribution, one 9 by 4 inches, to be used for direct mailing and a smaller one, 6 by 3.5 inches, to be used as envelope stuffers.

The accompanying illustration shows

Advertising Blotter Issued by Beck Company.

the larger blotter. As is indicated in the text, by placing a stamp over the old one and crossing out the name of the recipient the blotter can be used as a return card. The smaller blotter is likewise arranged as a return card; in this case, however, it is necessary to fill in his name and address.

The company has received considerable favorable comment relative to its trade mark letter "B," and its slogan, "Best Electrical Construction Konceivable," employing the letters of the name "Beck."

Electricity Extensively Used On Large Construction Job.

The extensive use of electricity and electrical equipment on one of the largest construction jobs handled in Cincinnati, Ohio, for several years is proposed by the Charles McCaul Company, which has the contract for the building of the new courthouse. All machinery which can be electrically operated will be arranged for motor drive, the company believing that the elimination of smoke and the other advantages resulting from the use of electricity will be important.

Missouri Electrical Contractors Change Meeting Dates.

The Electrical Contractors' Association of the State of Missouri will probably change its plans of annual and semi-annual meetings to harmonize more closely with the plans of the national meetings. Heretofore the semi-annual meeting has been in December, the annual in July, whereby the appointment of national delegates and officers has not fitted well with the necessary work that they do at the national convention. It is planned to hold the Missouri annual the third Saturday in January; and the semi-annual just before the national in July. The semi-annual meeting this year will be July 10, at Kansas City, Mo. The Kansas Electrical Contractors' Association will also meet in Kansas City, Mo., July 10, and the two associations will hear the reports of the committees appointed to consider a plan of consolidation.

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y. WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa. WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

Members will have seen in the Electrical Review and Western Electrician recently that a statute requiring the registration and licensing of electricians has just gone into effect in Massachusetts, though certain of its penal provisions do not take effect for three months from July 1. This is a bill for which the electrical interests have been working for years. It was first put forward by the Massachusetts Contractors' Association but met with defeat several times; then it was taken up by what is now the Eastern Massachusetts Section, National Association of Electrical Inspectors. A bill was drafted, the Contractors' association and the Wiremen's Union were interested, and smooth sailing was had all through the legislative committe public hearings, only to have it turned down after objections by certain theatrical interests had been presented.

It was then taken up again by the Contractors' association and pushed for several years, our position being that we would back any bill embodying the desired principles but that we would not take issue over any specific point as to fees, examiners, etc., preferring to leave such details to those more vitally concerned with them.

This year practically every electrical interest was represented on the committee headed by Mr. Hixon, a well known electrical contractor of Boston and as a result of untiring efforts this bill has resulted.

It was reported against in the Senate, the committee report appealed from on the floor, overturned and the bill passed. It then went to the House, again was turned down, but in spite of adverse report taken up and passed in the very last days of the session, when the calendar was loaded with Boston & Maine Railroad business, being amended however in one unimportant particular, necessitating sending it to conference; but it succeeded in weathering this and was finally engrossed and signed.

It is the belief and hope of the inspectors that it will affect the work of wiring in the commonwealth for good.

I give below two answers to questions 301 and 302 which were printed in the issue for June 19. These are from Excommitteeman "O" and were received just too late for use.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

But one question is printed in this number, the main portion of the space being given over to the paper on "Inspection Problems at the Panama Exposition."

Members will please note that Mr. F. L. Warner's address is changed from 65 West Sixty-ninth Street, New York City, to 139 Clinton Street, Brooklyn, N. Y.

Any member expecting to be in San Francisco at the time the Insurance Congress meets (between October 4 and 16) will please notify our representative, C. W. Mitchell, 914 Merchants' Exchange Building, San Francisco, to that effect as soon as reasonably sure of his plans.

Answers to Questions 301 and 302.

301. An incomplete outlet with wires not soldered and not taped or with outlet box not covered either by the fixture or by approved box cover unquestionably introduces Code violations which should be noted by the inspector. However, it is not within the province of the Code nor is it as a rule the duty of the inspector to fix the responsibility for this incomplete condition of the work. When a dispute arises as to what particular subcontractor should complete the work at outlets, it would then be the duty of the inspector to report the conditions to all of the parties at interest, such as the owner, the occupant, the architect, the builder, the wiring contractor and the fixture contractor.

302. The terms "accessible" and "readily accessible" occur at frequent intervals in the Code and must be defined according to conditions, and with particular reference to the devices referred to in each case. In Rule 23c, "readily accessible" refers to location of fuses. Fuses are automatic devices and do not have to be handled, and, therefore, there is no reason for requiring the fuse to be within reach from the floor in order to be accessible, such as is the case with a switch, a manually-operated device; in fact for many years it has been customary in certain forms of exposed wiring to locate branch fuses on the ceiling and, while centers of distribution are recommended, the location of the fuses on the ceiling has not been considered contrary to the Code.

Flexible Armored Cable in New Residences.

Question 303.—In wiring new frame houses with flexible armored cable there seems to be a difference of opinion among inspectors as to whether the cable may be laid directly on the top of the joist and the under floor fitted up to it on each side; the joist notched and the notch covered with sheet metal; the joist bored for the ca-

ble. What does the Code require in this instance?

Answer 1(U). I know of no rule to prohibit any of the three constructions; there might be objections to each in some cases.

Answer 2(M). The Code does not specifically state that any of the three is required. Either would be considered satisfactory from a mechanical standpoint, the Code stating only that "the entire system must be mechanically secure."

Answer 3(K)*. Rule 27a simply requires mechanical security. Regardless of which might be considered "the best method," either of the three will comply with the Code.

Answer 4(P)*. The Code is silent upon this point, the presumption being that the armor is considered of sufficient strength to resist penetration by nails. This presumption is probably true, unless both cable and nail are held rigidly in position with reference to each other while the nail is being driven. Answering specifically then: Laying the cable on the joist and fitting under floor up to it is not good practice; notching the joist and covering with sheet metal is good practice; boring the joist and pulling cable through would comply with the Code, but is unusual.

Answer 5(R)*. Apparently the Code does not specify anything beyond mechanical security. The most popular method in this territory seems to be boring the joists.

Answer 6(F&G). In this territory most of the new houses are concealed knob and tube construction. However in houses already built the armored cable is sometimes used. In these cases we require either that the joists be bored at least three inches below floor level or else that the joist be notched and covered with sheet metal strong enough to turn a ten-penny nail. We do this because an ordinary nail will penetrate the armor of some cable, and this is liable to occur when the floor is laid. We require this under Rule 26-e—"Wires must, where exposed to mechanical injury, be suitably protected."

Answer 7(L). The Code does not contain anything specifying which of these three ways should be used.

Answer 8(J). In territory I have visited where the Code is closely followed the usual practice seems to be to bore the joists and pull the cable through.

Answer 9(B)*. The proper way, in our judgment to run armored cable in new frame house is on the side of joist or under edge of same and not on top of joist with floor fitted to it, as under such conditions a nail is liable to be driven through the cable armor.

Answer 10(T). The Code does not specify as I can see how the armored cable should be installed, and I do not believe an inspector under the present Code rules can make any rulings requiring any particular one of the methods mentioned in the question to be followed.

Answer 11(N)*. I do not know of any installation of this type in this territory. However, I do not think it the province of any inspector to prescribe methods, he can only insist on mechanical safety. Under this I should rule out the first plan; either of the others might be acceptable. I like drawing in under the joists, parallel with the strapping pretty well, and that is done in the short bits of cable construction I have seen here.

Answer 12(H)*. The Code is silent on these particular points; however, I think running parallel with joists and securing to middle of same, and boring joists where necessary would be the safest construction.

Answer 13(O). The special rules for the installation of armored cable do not cover specifically the point in question, but it is clearly necessary to give some thought to the protection of armored cable against nails. It has been the practice in this department to prohibit the placing of armored cable over a joist in such a manner that it will be held in a fixed position and so subject to puncture by nails used in fastening the floor. This ruling is defended by the clause in 26-e, "must, where exposed to mechanical injury, be suitably protected."

Problems in Electrical Inspection at the Panama-Pacific International Exposition.[1]

During the past ten years it has been customery for various electrical inspection departments throughout the United States, which have adopted the National Electrical Code as their standard, to make numerous and diverse rulings suited to their local conditions, and which are either amplifications of the Code or special rulings attached thereto. These rulings have been made frequently, a cause for the claim that the National Electrical Code does not completely cover the field, or that it is not self-explanatory to the desired degree, and, therefore, it has been necessary to make these rulings in order to clear up certain disputed points.

It will probably be of considerable interest to know that all of the electrical work installed at the Panama-Pacific International Exposition has been installed and inspected under the standards set forth by the National Electrical Code as interpreted by the representatives of the Board of Fire Underwriters of the Pacific.

It is believed that the electrical installation at the exposition is the largest installation ever constructed where the slogan "Let the Code Decide," may truthfully completely apply.

In considering the problems which confronted the inspector, in fact, in looking at any problem, we are anxious to know, first the problem, and secondly to know how it has been successfully solved. The problems involved in the inspection work at the exposition resolved themselves into three classes: the material, the men, and the rules.

While it would seem to everyone connected with the electrical industry, that the problem of material would be readily solved by means of the List of Approved Fittings and the reports of the Underwriters' Laboratories, such was not the case. In the past it has been customary to unload at expositions, all of the sub-standard, low-grade, and non-Code material available throughout the country—on the grounds: first, that it was cheap; and second, that the installation was of a temporary nature.

Past experience has shown that at the expiration of an exposition, vast quantities of non-Code material, such as wire, receptacles, switches, etc., were bought up and resold as standard. This material was disposed of through channels which made it difficult to determine its final destination. Even in this enlightened era it would not be difficult for unscrupulous contractors to install in districts where inspection was lax—or worse still, a negative quantity—non-Code material, which, when installed would render the installation defective.

The elimination then, at the exposition, of non-Code material, obviates not only a certain fire hazard, there, but will prevent the flooding of the immediate field with wire and devices that would require "eternal vigilance" on the part of those entrusted with maintaining the fire hazard to property, from an electrical standpoint, at the minimum.

I presume that the greatest offender, in regard to unapproved receptacles, was our old familiar friend the receptacle with the single screw hole in the

[1] A paper by G. A. Cleary, of the Bureau of Fire Underwriters of the Pacific, Secretary of the California Section N. A. E. I.

center. Contractors who have been in business for years never heard of the receptacle being non-Code, and that it was not permitted particularly for exterior lighting!

This problem of exterior wiring was quite a serious one, because outlining was the rule rather than the exception in the Concession district. Cleat weatherproof receptacles were required, but the fact that receptacles which separated the wire one inch from the surface wired over were on the market seemed to be a matter of absolute indifference to some of the contractors. As this form of construction is not permitted in many of the larger cities, the requirements for outline lighting had to be explained in detail. It was frequently found that while an approved one-inch receptacle was used on the outside of a building the wires would be supported on cleats which separated the wire but one-half inch from the surface wired over.

A condition was met at the exposition which greatly interested the fire underwriters' representative; namely, that of the motion picture installations, of which there are 59 in the various palaces, State and foreign buildings. The first problem introduced by this was the question as to what portion of the building should be wired in accordance with rule No. 38 of the Code, which relates to Theater and Moving Picture Wiring. Due to the fact that in all large cities this section of the Code is intended to mean the entire building rather than that portion of the building affected, the opinion prevailed that the entire building would have to be wired in conduit or its equivalent, but of course this is not the case, inasmuch as the Code specifically defines that "that building or that part of a building regularly or frequently used for motion picture shows" shall be wired in conduit or its equivalent. It was therefore necessary to decide which portion of the building fell under this section; inasmuch as it was not the desire of the Inspection Department to make the installation any more expensive than was absolutely necessary.

The general ruling decided upon then was that all wiring in or on the walls, ceiling, or floor joists, of that portion of the building, namely the room or auditorium used in conjunction with the motion picture show should conform to Section No. 38.

The type of operating room most widely used is wood, metal lined. This type of room has sheathing walls and ceiling tongue and groove wood at least three-quarters inch thick, with the inside of room presenting flat surfaces, all studding, braces, etc., being on the outside. Lining is of sheet metal at least No. 30 U. S. gauge with the joints locked one-half inch and nailed under seams. Openings for machine and operator's view are provided with sheet iron shutters which slide freely in metal grooves.

Motion picture exhibitors appeared never to have heard that magazine rewinders or approved film storage boxes were ever required by the Code, their belief being that the ordinary open rewinder and film box which permits communication between reels were satisfactory.

The location of the oil-cooled transformers for stepping down the high-potential to that of the supply mains in the buildings was a question which early confronted the Underwriters' interests. The class of construction decided on consisted in locating the transformers in a concrete vault with communication and ventilation only to the outside of the building.

The voltage on the high-potential side of the transformers is 11,000. The primary feeders are brought into the vault underground, all high-potential wiring terminating in the vault.

The switchboards for controlling the various low-potential feeders inside the buildings are mounted against the walls of the transformer enclosures within the building and with the feed wires brought through in duct.

In one instance it was necessary in order to have a "live" exhibit for a transformer to be located inside one of the exhibit palaces. This was accomplished by using an over-capacity oil-cooled transformer without the case and oil and mounting it for air-cooled operation.

The use of approved type of cabinets appeared to belong to some future period. Anything made of wood or iron was presumed to meet the standard, as set forth in the Code, until it was rejected and ordered removed. It was thought that in lining wooden cabinets sheet paper asbestos was a satisfactory substitute for rigid asbestos board. Regarding the requirements for cabinets, as for instance the proper gauge metal, lining material, rabbits, riveting, maximum width for a single door, etc., on such details a certain class of electricians appear to be vaguely informed.

It was difficult to impress on wiremen that the use of a terminal fitting that did not have a separately bushed hole for each wire, was not in accordance with the inspection requirements.

Some contractors had never heard that theater borders were supposed to be wired with slow-burning wire and to have the joints where the border-light cable connected to the wiring of the border proper located in an accessible splicing box; also with the splices relieved of all strain.

It was not known that wiring at the back of switchboards, where they are bunched or cabled or brought close together in any manner should be flame-proofed. The objection to the use of rubber-covered wire in this case was overcome by serving the wire with a wrap of asbestos tape.

The fact that conduit was required to be grounded appeared not to concern certain of the contractors. The amount of conduit not required to be grounded differed, depending on the locality in which the electrician was accustomed to work, and the inspector passing on his work, but they were all agreed that a few lengths of conduit need not be grounded.

The men took the attitude that they had been doing these things for years and "getting away with it;" they reasoned that inasmuch as the exposition lasted only one year there was no reason why they should not do the same thing at this exposition also. They have been accustomed to rulings not in accordance with the Code, or to the winking at certain infractions of the Code rulings, and thought that this was the place where everything was to be free and easy; and that so far as the Code was concerned it was a closed book. This naturally meant that the duty of the inspector was not only to make a ruling, but also to assign a reason why and then educate the men up to the standard of doing work in accordance with the Code.

In many instances exhibits were installed with electrical devices and materials of foreign manufacture. A considerable problem consisted in determining whether they did or did not comply with the Code requirements or introduce an additional fire hazard when installed.

Exhibits were received from Germany, England and Holland in the "knocked down" condition, having been already wired in these countries ostensibly in accordance with the standard of these respective countries. It was not believed, however, that unlined brass shell sockets, No. 16, B. and S. gage, rubber-covered wire secured to button knobs with tie wires, receptacles with insufficient clearance, lack of insulating bushings and canopy insulators and certain types of lamp "holders," etc., reasonably fulfilled the requirements of the Code. These are illustrative of details objected to in exhibits of foreign origin. Installations of this character necessarily were required to be reconstructed. Not being familiar with the electrical standards of this country, it was difficult for the exhibitors using certain foreign materials to appreciate the reasonableness of the requirements of the Code. It was interesting, however, to note that

the electrical equipment sent from Japan was mostly of American manufacture or standard.

Some of the foreign countries exhibiting at the exposition have a stock exhibit which they send from one exposition to another. In one instance an entire installation was required to be rewired with approved material.

While on the subject of non-Code material it might be said that Eastern manufacturers of this country were the greatest offenders. For instance, in the matter of sign-flasher boxes, they seemed to think that anything that was used to cover a sign flasher constituted suitable protection. They were invariably rejected when not constructed of metal of the proper gauge. Cut-out boxes not an integral part of a sign, and located in the same as required by the Code, were made of the same gauge metal as the sign itself, instead of conforming to the required standard for cabinets. They appeared evidently, not able to differentiate between a cabinet for the enclosure of cut-outs on the ordinary circuit, and a circuit supplying lights on a sign.

Low-voltage lighting is used extensively on maps, models, etc., and it was required that the primary side of the transformers feeding these exhibits should be installed in accordance with the rules for Class "C" wiring. In several instances, transformers supplying this class of exhibit were of two and three kilowatts capacity. It was required that flame-proofed wire be used on the low-voltage side, as the leads developed considerable heat, and it would have been quite impractical to maintain any separation. This class of exhibit was usually shipped to the exposition already wired and it was interesting to note the different degree of precaution taken by wiremen in the different sections of the country. In the majority of the cases the work was well executed but in several instances models required a complete overhauling.

A large model was received lighted with low-voltage lamps in non-approved receptacles connected in series for use on a 110-volt circuit. It was required in this instance that the receptacles not being approved for use on 115-volt circuits, they should be connected in parallel and supplied with current from a low-voltage transformer.

Exhibits were installed in which were incorporated alternating-current motors so wired that the motor had no fuse protection during the period of starting.

Starting devices were sent with motors which if installed necessitated that one leg of the three-phase mains be hot in the motor at all times. It was required in these cases that a switch be provided so that all wires of the circuit could be disconnected from the motor.

The question frequently arose as to the size of wires to be used where motors were used for demonstration purposes only, although they were of sufficient size to drive the connected machines at their rated load.

Where 1,320 watts should be allowed on a circuit, the No. 14 feed wire running direct to keyless porcelain receptacles and located so as to render unlikely the attachment of flexible cords thereto was a question which arose frequently, the condition being quite general, as gas-filled lamps are widely used.

To appreciate fully the inspection problems met with it must be remembered that the exposition was a clearing house for wiremen from all over the United States. If a certain objection were taken to certain details of construction one would be informed most likely that it was an approved method in such and such a place.

In analyzing the conditions presented at the exposition one point appears predominant, namely, the lack of uniformity in the interpretation of the Code.

It is safe to say that the major portion of electrical contractors are more than anxious to install work properly if they are aware of the requirements. They claim that when left to the inspector the interpretation of the Code is too flexible. "Some require one thing and some another more drastic, and yet both claim it is in accordance with the Code," is the wireman's argument.

The conditions at the exposition were no different than those of other parts of the country regarding contractors. Here as elsewhere you knew which of those concerned installed work properly, which had no thought of evasion but were simply lax, and you quickly spotted the individual whose sole aim was to skin the job.

To the inspectors of the electrical department of the exposition is due great praise for the manner in which they handled so complex a problem of installation. By a system of certificates, similar to municipalities an absolute check was kept of all work installed, and it was required that all work be in accordance with the Code before service was connected.

It is believed that many wiremen are better informed as to the requirements of the Code as a result of the exposition, for as many have remarked, especially those from large centers, it was the first straight Code job they had ever worked on. For instance, due to local rulings in many places against wood moulding and cleat wiring, the majority of the mechanics thought these classes of construction were absolutely prohibited by the Code.

Under like conditions what is deemed safe from an electrical viewpoint in one locality, is safe in another, but experience shows that while certain types of construction are prohibited in different localities the inspection interests are far from being of a like mind. To agree on and require the same thing in each instance is the ideal for which we should all strive.

Lynn Station Remodeled.

The Lynn Gas & Electric Company, Lynn, Mass., is making radical changes in its generating station. A new 5,000-kilowatt-ampere steam turbine has been installed. The rectifier units, of which there are a large number, operated in connection with the new magnetite arc street-lighting system, have been removed from the wooden station floor and relocated directly beneath in the concrete basement which, the floor being removed, is now open to the roof.

Iron galleries have been constructed along the front of the switchboard, to take the place of the floor, and also along the station wall, to connect with the generating area opposite. An electrically-operated traveling crane of large capacity has been installed over the new turbine and an adjacent generating unit.

Water Resources of Rio Grande Basin.

The United States Geological Survey has issued, as Water-Supply Paper 358, a report on the water resources of the Rio Grande basin from 1888 to 1913, by Robert Follansbee and H. J. Dean. Systematic study of run-off in the Rio Grande basin was begun by the Federal Government near Embudo, N. M., soon after the passage of the act of October 2, 1888, which authorized the organization of the irrigation survey under the direction of the United States Geological Survey. At the end of September, 1913, records had been obtained at 93 gauging stations.

The report contains not only all data concerning stream flow in the Rio Grande basin collected by the Survey and co-operating parties, but also records furnished by individuals connected with private interests.

A copy of the report may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

The United States Geological Survey places the American smelter production of copper during 1914 at 1,150,137,192 pounds and the refineries' output at 1,565,708,374 pounds.

Public Service Commissions

Conducted by William J. Norton

IDAHO.

Southern Idaho Water Power Company. The Pocatello Gas and Power Company filed a complaint with the Commission alleging that the Southern Idaho Water Power Company has discriminated in its charges in competing with the complainant for business in Pocatello. During the time the case has been pending before the Commission the parties have adjusted all of the difficulties except the question of proper charges for current used for water heaters. The complainant alleges that the rate offered by the defendant for water heaters is less than cost, discriminating against consumers using current for other purposes, and that it was instituted for the sole purpose of unfairly competing with the complainant in the water-heating business.

The schedule of rates filed with the Commission for the service in question is as follows: "For domestic heating, $2 per month for first kilowatt and $1.50 per month for each additional kilowatt capacity connected; and for commercial heating, $3 per month for first kilowatt, and $2 per month for each additional kilowatt capacity connected."

These flat rates are in effect in all places served by the defendant and by the Great Shoshone Company. The decision says: "Is the rate charged by the defendant company for water heating purposes unreasonable when compared with the rates charged for other uses? This is a big problem, and can only be determined from a full and complete valuation of the company's system and a thorough investigation into the cost of generating and delivering the several classes of power. This Commission has not yet undertaken this task, and is not now in a position to do so, by reason of the failure of the Legislature to make an appropriation with which such an investigation might be carried on, although we have now under consideration a general investigation into power rates. Evidence was introduced in this case tending to show that the average cost per kilowatt-hour at the consumers' meters in Pocatello, of electrical energy for all purposes was about one cent, and that the rate charged these water heater users, if the heater were used on high for the 24 hours of the day, would be only 2½ mills per kilowatt-hour so used. That this class of service is, therefore, furnished for about one-fourth of cost, and, therefore, must be unreasonable. The premises from which that conclusion is drawn have not been substantiated by proof. If this were the only class of service furnished by the defendant company the position taken might be true. This water heating service is only one of many classes of service and uses to which electricity is now put. It is recognized by all authorities that the use of electricity for illuminating purposes is, at the present time, the highest use to which it can be put. This use involves the use of the plant and equipment, generally speaking, from three to four hours a day, usually from seven to eleven in the evening. This use takes precedence over all other uses, and electrical energy must be furnished for this use at all hazards. The result is that in fixing rates the lighting rate must necessarily be the highest rate for any use. The great problem with hydro-electric public utilities is to find other uses to which this power can be applied for the other 20 hours of the day. Consequently, the rates for electrical energy for other uses must necessarily revolve around and be interdependent upon the lighting rate. The great aim of a public utility of this character is to secure a high load-factor. It is contended by plaintiff that the use for these water heaters interferes with the peak-load—that is, the lighting load—and consequently the above reasoning cannot apply. The answer to that in this case is that the evidence shows that the company has an abundance of surplus power, even when the peak-load is on. The evidence shows that this company has something like 2,300 lighting customers in the city of Pocatello, and that it has secured, after a lot of advertising and soliciting, only about 50 water-heater customers. So even at this low rate it has made no great progress in securing this class of business. The reason why must be that the cost of installing this class of service and the rate is not yet sufficiently low to induce a broader use of the same. This is true that if this class of service were cut out altogether (which result would inevitably follow the increasing of the rate to that advocated by plaintiff) the operating revenue of the company would be reduced just that much, and the rate for some other class of service might have to be increased to make up that loss, while the evidence shows that the additional expense for taking care of this class of service is very small."

The complainant offered evidence to show that the lowest price at which it could afford to furnish gas was $1.20 per 1,000 cubic feet, and at that price it could compete in this class of service with defendant, if the rate on electricity were increased to one cent per kilowatt-hour. This contention was not satisfactorily sustained, and, furthermore, the Commission says: "That being true we would hardly be justified in compelling defendant company to raise its rates 300 per cent for electrical energy for this class of service, so as to enable the plaintiff company to compete with it in that service. . . .

"A rate voluntarily established by a public utility must be regarded as prima facie reasonable. Home Telephone & Telegraph Company vs. Pacific Telephone & Telegraph Company (Cal.) P. U. R. 1915 A. p. 687. That being true, the rate voluntarily established by defendant company for this class of service must be presumed to be reasonable and the evidence introduced in this case is not sufficient to overcome that presumption."

The Commission finds that the complainant failed to sustain the allegations of its complaint, and the complaint was dismissed.

It was urged that under the Idaho law the case was not properly brought before the Commission. The complaint was not made by the Commission on its own motion, by the mayor of Pocatello, by a majority of the city council or by 25 consumers of either of the companies. The complaint was signed solely by a competing company. The Commission did not discuss the contention further, however, "preferring to decide the case upon its merits rather than on a jurisdictional question."

INDIANA.

The Southern Telephone Company, which recently took over the Indiana holdings of the Cumberland Telephone & Telegraph Company, has surrendered the franchises granted the company in 53 cities of Indiana, and will receive in-

determinate permits from the Commission under the provisions of the public utility law.

MARYLAND.

The Consolidated Gas Company filed a bill in court resisting the Commission's order, which gave the company the option of reducing its rate or maintaining the double standard of service. The company intimated, however, that it would drop the litigation and comply with the order if the date when it is made effective be postponed. The Commission has issued a supplementary order which postpones the order six months. It is understood that the company will reduce its rate to 75 cents per thousand cubic feet, on January 1 and put into effect the single standard of 600 British thermal units.

MASSACHUSETTS.

The Thirtieth Annual Report of the Board of Gas and Electric Light Commissioners has been issued for the year 1914. The report contains the decisions rendered during the year, and statistics and information compiled as in former reports. The rates for gas and electric companies are tabulated. General information is given regarding the municipal plants and the rates for these plants for private consumption, and the cost of furnishing street or public lighting is also tabulated.

NEW YORK—Second District.

The Buffalo General Electric Company. The Commission has rendered a decision authorizing the merger of the Buffalo General Electric Company with the Cataract Power and Conduit Company. The consolidated company will operate under the franchise of the Buffalo General Electric Company. The order provides for a reduction of 19 per cent in rates to consumers. The consolidation must be effected before September 1.

In the opinion, written by Commissioner James O. Carr, a brief statement is made of the relation existing between these companies in the city of Buffalo, as follows:

"The electrical energy which is used by these companies in the city of Buffalo is obtained from the Niagara Falls Power Company. At the time the rate cases were pending (2 P. S. C. R. (2D) 739), the Cataract Power and Conduit Company sold and at the present time it sells electrical energy at wholesale obtained from the Niagara Falls Power Company in the city of Buffalo and the Buffalo General Electric Company in turn sells electrical energy which it purchases from the Cataract Company at retail in said city. In some instances the former company also does some business which might properly belong to the Buffalo General Electric Company when considering the sale of energy at retail as distinguished from wholesale. The Cataract Company sells a large amount of its power to the Buffalo Company, and in many respects it might properly be considered as the middleman in the sale and distribution of electrical energy generated by the Niagara Falls Power Company and sold in the city of Buffalo. As was stated in the opinion of this Commission in the Canadian-American Power cases, 'The Cataract Power and Conduit Company has no true economic place in Buffalo. The Buffalo General Electric Company or some other corporation should be the sole distributing company. The Niagara Falls Power Company, both Canadian and American, should sell power to that company at the lowest price consistent with expenses, interest and maintenance.'

"There is no reason why the business in the city of Buffalo cannot be handled as well by one company as two, and, in fact, it is the general experience that in situations of this sort it is undoubtedly better for all concerned, the public as well as the companies, if there is but one concern distributing electrical energy in the community. Particularly is this true if the profits of the middleman are wiped out and the public is permitted to participate in the benefits thus obtained. While it is true that the two companies in question do not at the present time compete with each other to any extent, yet, it may readily be imagined that a situation might arise whereby there would be a severe competition between them which might create serious difficulties."

No new securities are to be issued upon the consolidation. While it was urged that the capital of the Cataract Company was too much to load on the new consolidation, Commissioner Carr points out that the liquid assets of the company seem to bear out the value placed on the stock.

"Another ground of opposition at the hearing was the fact that the Buffalo Company proposes to issue its securities in payment for the stock of the Cataract Company; that this ought not to be done because the Commission has decided in the Cataract rate case that none of the stock had been issued for cash or an equivalent in property. There was no dispute as to this fact, and the books of the Cataract Company clearly showed it. Notwithstanding this it was strongly contended by the Cataract Company that the rights obtained by the issuance of this stock did have a substantial value. However, the situation now presented is such that the Commission may properly require the companies, if this merger or consolidation is to become effective, to write off a substantial portion of the intangible value, which represents the stock, and, in the opinion of the Commission, this can be accomplished to a very large extent by requiring as one of the conditions of the merger that this intangible value should be written off to the extent of $1,384,000, which is the amount of the par value of the bonds of the Cataract Company now outstanding, and the order will so provide. If this is done then all of the objections against the merger or consolidation which have been presented would seem to have been properly disposed of."

WISCONSIN.

Oshkosh Waterworks Company. The Supreme Court issued a decision June 1, 1915, upholding the Circuit Court of Dane County in its judgment in the Oshkosh Waterworks Company case, finding that the purchase price for the taking over of the waterworks by the city was a fair compensation, and that the terms and conditions of the sale were reasonable as fixed by the Commission's order. (Decision of the Circuit Court, reported in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, November 7, 1914, p. 906.)

The court, in affirming the judgment of the lower court and upholding the order of the Commission, holds that upon appeal from an order of the Commission the burden rests upon appellant to establish "to all full satisfaction of the court" that the compensation fixed is unlawful.

"In the proper valuation of a public utility for condemnation or sale purposes certain main elements usually present in every case may legitimately be considered. These are the present value of its physical property, the present and prospective reasonable earnings of its business, the going value thereof, and the amount of money presently needed to put the plant in good condition. There may be other elements, but these are generally the essential ones. In determining the value of the physical property, due regard should be had to the original cost thereof, the reproduction cost, the amount of depreciation, and the amount of obsolescence. The going value of a utility is that part of its value due to its having an existing established business. In fixing its amount the actual cost of establishing the utility in question as modified by what, under all the circumstances ought to have been its reasonable cost, as well as the reasonable cost of establishing like enterprises under similar conditions, may be considered. The element of going value is usually one whose quantum is not easily subject to mathematical demonstra-

tion. That in a measure is true of all the other elements of value. And it is equally true that the elements of value spoken of, or others, if there be any, may not in their aggregate represent the just value of the utility. Such value may be more or less than the aggregate of the sum of the elements found. And it may be that some elements that enter into the main elements of value above stated should be entirely eliminated in fixing the just value of the utility as an entity. Its value must be fixed as such. C. & N. W. Ry. v. State, 128 Wis. 553, 108 N. W. 557; Appleton Waterworks v. Railroad Commission, 154 Wis. 121, 142 N. W. 476, 47 L. R. A. (N. S.) 770.

"It is because the valuation of a utility cannot be reduced to absolutely fixed rules, or to the mere appraisal of parts whose sum equals its value, that the subject is one upon which honest and competent men differ. In the last analysis it is the exercise of a sound and competent business judgment upon many elements of uncertain and debatable value considered as a business entity. Hence grave errors in arriving at and seriously affecting the final result must be shown before a valuation of the Commission can be set aside."

In taking this case to the court the company raised the question of the rights of the bondholders and the protection of their rights under the indeterminate permit. The court says:

"What has already been said disposes of the claim that the Commission should have provided that plaintiff receive its money without calling in its bonds. When it accepted an indeterminate permit it agreed to sell to the city at any time the latter might elect, and it must then have contemplated that, if the city did so elect before the bonds matured, it would have to call them in. The city is under no duty to assume plaintiff's contract obligations. Green Bay & M. C. Co. v. Kaukauna G., E. L. & P. Co., 157 Wis. 412, 147 N. W. 701. It is bound to pay only the just value of the utility. The fact that plaintiff has entered into a contract whereby it will cost it something to deliver the utility to the city cannot affect the reasonable value of the utility. The city is not concerned with the terms of settlement between the utility and its creditors so long as it receives the property free from liens. To require the city to pay the premium would be to require it to pay the bonus plaintiff agreed to pay for the use of money. Municipalities have nothing to do with past obligations incurred by the utility, except in so far as they may be a lien upon the property brought. If they are, the utility must satisfy them out of the purchase price, if that is sufficient to do so. That is all the Commission required in this case."

Pierce County Telephone Company.

Application was filed with the Commission by subscribers of the company for a reduction in telephone rates. The Commission finds that the company's financial condition, as reflected by the figures in its last report, is such that it can be required to furnish good service in strict accordance with the standards of telephone service as fixed by the Commission; but that the fact that the company is earning practically 7 per cent upon its investment cannot be held to be evidence that rates should be reduced. The Commission continues: "The only other matter which need be mentioned in connection with this case is the contention of petitioners that telephone companies in other parts of the state and in other parts of the country are furnishing good service at a lower rate than the rate charged by the respondent. In regard to this, it might be said that we have had occasion to investigate the cost of service of telephone companies in a great many cases, and although it is entirely true that rates lower than these of the Pierce County Telephone Company are in effect in many places for rural service on metallic lines, we have not found an instance where unlimited service is furnished to rural subscribers over a large system where lines are metallic and the number of subscribers properly limited where a rate much, if any, less than $15 per year would permanently suffice to meet the operating expenses of the utility, provide a reasonable amount to meet deferred maintenance or depreciation charges, and pay a fair rate upon capital invested in the business."

The Commission emphasizes the importance of providing for good service rather than low rates in its conclusion, as follows: "Whatever the interest of the subscribers may be in this case in securing lower telephone rates, it must be assumed that they have an interest in securing adequate telephone service, and any reduction of rates in this case must inevitably result in lowering the standard of service which the company can be expected to furnish. As matters stand at present, the company can be expected and required to furnish telephone service of a very high grade, and we do not believe that the interests either of the company or of the community would be served by such a reduction in the company's revenues as must inevitably prevent the utility from maintaining a proper standard of service. When this is considered in connection with the fact that the utility is now earning just about a reasonable amount for depreciation and interest it should be evident that the application in this case should be denied."

MICHIGAN SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION.

Convention Cruise, June 26-30.

Following its custom of several years, the fourth annual convention of the Michigan Section of the National Electric Light Association was in the form of a four-day lake cruise on the Steamer *Rochester*, starting at Detroit on Saturday afternoon, June 26, and ending at Grand Haven on Wednesday afternoon, June 30. The trip was up Lakes St. Clair and Huron and the St. Mary River to Sault Ste. Marie, then westward across the upper ends of Lakes Huron and Michigan, through Green Bay and Sturgeon Bay Canal, Wis., southward on Lake Michigan to Milwaukee, across the lake to the Kalamazoo River and Saugatuck, then north again in the lake to Grand Haven. Stops were made at the "Soo" to view the great locks and the power house of the Michigan Northern Power Company, at Mackinac Island, Sturgeon Bay, Milwaukee and Saugatuck.

Every feature of the cruise, including delightful weather throughout, made the trip most enjoyable. The business of the convention was not strenuous, only three sessions being held for the presentation of addresses and the discussion of these and other matters of general interest. The program was intentionally planned to make the cruise as much as possible a get-together meeting and outing of members of the association, their friends and their families. Among the entertainment features were prize card contests for the ladies. The total number of persons on the trip was 146.

The first session was called to order by President H. A. Fee at 10:35 a. m. Sunday. Mr. Fee proceeded directly to deliver the annual presidential address, in which he first reviewed the activities of his administration. The uniform-accounting requirements of the Michigan Railroad Commission had been given careful study and much help was accorded to the members of the Michigan Section by the association. The great value of systematizing the accounting was emphasized. Mr. Fee referred to attempts to secure needed utility legislation from the last Legislature. The act that was finally introduced had many defects and it was not unfortunate that it failed to pass. A good utility law is greatly needed, however.

President Fee referred briefly to municipal ownership, the safety movement and concentric wiring. He felt that the central-station interests should be more actively represented on the committee in charge of revising the National Electrical Code. He pointed out the need of a medium for passing on electrical appliances as to their serviceability and econ-

omy. At present effective agencies exist for testing fittings and appliances as regards fire hazard and to a less extent for testing as to personal safety; no institution, however, passes on the suitability of appliances for the consumer. He therefore urged that the National Electric Light Association establish a testing department for this purpose. He also urged that efforts be made to evolve a uniform and simple system for rate making. He spoke of the desirability of coordinating the legal work of the various Michigan utility associations and in conclusion commended highly the active cooperation which had been received from members of the Jovian Order.

A nominating committee and a committee to draft suitable resolutions in memory of many recently deceased prominent Michigan electrical utility men were appointed.

An address on "Safety" was then delivered by Dudley R. Kennedy, of the Youngstown Sheet & Tube Company. He opened his remarks by referring to the safety movement in steelworks. The steel industry has always been known to be a very hazardous one. The Youngstown plant employs over 8,000 men. Formerly it was common to have 15,000 accident reports per year. Until the magnitude of the losses due to accidents was strikingly presented, it was felt that they were an inherent feature of the steel business. However, efforts were gradually instituted to reduce the losses. Mr. Kennedy described some of the safety measures, particularly the formation of safety committees on which the workmen were actively represented. This is an important feature in order to secure the earnest cooperation of the men. The result was a decided reduction in the number of accidents, in hospital and surgeon bills and in claims for damages due to accidents. Special study was given to the liability of having electrical accidents because of the large amount of motor-driven machinery. The proper handling of cases of electric shock was determined and several Pulmotors installed.

Mr. Kennedy spoke of the formation and work of the National Safety Council. Valuable information is sent out by it to members. He urged affiliation with the Council. He called attention to the value of physical examination of employes at the time they enter service and, if necessary, at periodic intervals. Such examination discloses important weaknesses that may disqualify a man for some particular work; it also discovers minor weaknesses that may be rectified on proper advice, so that the efficiency of the employe is enhanced and his liability to accident diminished. Attention to safety measures that reduce accidents greatly decreases the number of substitutions that must be made of inefficient helpers to take the places of injured men. The high cost of breaking in new men is not generally realized.

Taking up the extraordinary increase of speed of transportation media and the considerable increase of other hazards to the public attendant on the growth of utility service, Mr. Kennedy emphasized the need for active propaganda to teach safety to the public. He called attention to some of this work done very successfully in several cities through lectures and moving pictures in the public schools, through newspaper publicity and other means. He said the "Safety First" slogan is no joke nor hobby; it is a clear-cut business proposition. Employers and operators of utility properties must be impressed first with the financial advantage resulting from safety work, then with the improvement in efficiency it promotes, and finally with the humanitarian aspects of the broader work among the public in general. Organized earnest work is necessary to accomplish these results.

An address on "Recent Decisions Influencing Public Utilities" was then made by James V. Oxtoby, counsel of the Edison Illuminating Company of Detroit. A recent decision of the California Commission was referred to in which the statement was made that the unscrupulous promoters who sap utilities are happily diminishing in number. This is a hopeful indication that public bodies are appreciating the efforts of the present-day utility men. Mr. Oxtoby touched on a recent United States Supreme Court decision reaffirming the right of the Wisconsin Railroad Commission to change rates specified in a franchise. This shows that if the state utility laws are broad enough to confer this power on the commissions, the exercise thereof despite apparent contract requirements will be backed up by the courts. Other important cases on which the Supreme Court has acted are the North Dakota lignite case and the Norfolk & Western case. These show that a uniform rate for any class of utility service will be approved even though in some isolated cases in the class they may not prove remunerative, provided the income from the class in general produces a reasonable profit. To make up deficits in one class of service by excess profits in another is not sanctioned. These and other important cases indicate that the courts are getting abreast of the progress of the times in matters of economic as well as political and social interest.

In the discussion that followed, Mr. Oxtoby was asked a number of questions of legal interest to utilities. He said that at present the Michigan Commission cannot change utility rates of its own volition but only on complaint. It has no authority to change agreed rates, and has no jurisdiction over the rates of municipal plants. Respecting new extensions, these will not be ordered constructed if they are bound to result unprofitably. However, extensions already giving service must be maintained, even though unprofitable.

Monday evening a session was held at which Evan J. Edwards, Cleveland, O., presented an illuminating lecture on the "Romance of the Lamp Industry." This was illustrated with a very large number of views tracing the historical development of artificial lighting from ancient times and leading up to the development of modern illuminants, particularly the electric incandescent lamp. The construction and manufacture of incandescent lamps was described in some detail and views shown of various stages in the process. Mr. Edwards then took up the portrayal of some fine examples of special lighting, particularly of the Panama-Pacific International Exposition at San Francisco. Other examples of flood lighting by means of projectors using Mazda type C lamps were also shown.

Samuel A. Freshney, Grand Rapids, Mich., then made an address on "Reminiscences of the Early Days of the Electrical Industry." Though the industry is said to be one of young men, yet the financing, public policy and general administration are largely in the control of men who have been engaged in electrical work for very many years. He touched on a number of incidents in the development of the industry, referring to such matters as when it was customary to employ a separate generator for each arc lamp. The old installation rules were very quaint in the light of modern practice. Mr. Freshney reviewed some of the developments of station equipment and described early business and sales methods. The early saelsman was frequently called upon to be promotor, designer, installation and consulting engineer, operator, and general all-around man. Some of these men have developed into leaders of the industry today. In the early days rule-of-thumb methods and guesswork were employed instead of mathematics. From these crude beginnings, however, the industry has evolved in a marvelous manner, and the extraordinary advance achieved has been with no little stress and strain on the part of those who participated.

On Tuesday afternoon a session was held in the nature of a round-table discussion of important problems before the central-station industry. President Fee introduced the subject of what may be expected in the way of further improvements in Mazda type C lamps. E. J. Edwards said that just as the vacuum type tungsten lamps have been steadily improved during the past five or more years, so it may be expected that the gas-filled lamps will likewise be improved. Through

further concentration of the filament and employment of special gas filling, it may be possible to reduce the size of lamp which can be manufactured of this type. However, the improvement in the efficiency of the small lamp will probably not be so radical.

Replying to a question by Mr. Freshney as to result of the new gas-filled lamps on central-station load and revenue, Mr. Edwards said that when the vacuum-type tungsten lamp was introduced this question aroused much trepidation on the part of central stations. However, it was found that the standard of illumination was greatly increased on account of the improved efficiency of the lamps and the load was not materially decreased. The tendency toward further improvement in standards of illumination is marked, and there is an urgent demand for more light and not less cost. Moreover, indirect lighting and semi-indirect lighting are coming into much greater vogue; these methods of illumination require more wattage than the older direct methods, and the increased efficiency of lamps now available permits this improved illumination without increase in cost. In many places, such as dry-goods stores, color-corrected lamps are also coming into more general use for accurate daylight color matching. As to whether the blue-bulb lamps are superior to mercury-vapor lamps in photographic work depends on whether it is desired to secure a light closely approximating daylight or an intensely actinic light.

The question of the comparative cost of magnetite arc lamps and gas-filled tungsten lamps was brought up and J. H. Lobban, of Detroit, presented the comparative costs of an installation of four-ampere magnetite arcs and one using 20-ampere 600-candlepower gas-filled tungsten lamps, each provided with a compensator. Included in the data were cost of power generation at one cent per kilowatt-hour, all incidental line and substation equipment costs, cost for trimming, lamp renewal, etc., and fixed charges on the investment. Each lamp was assumed to be operated 4,000 hours per year. The annual running cost per lamp for power consumed was given as $16.90 for the magnetite arc, and $17.09 for the tungsten lamp. The annual running cost per lamp for renewals, trimming, repairs, etc., was $7.12 for the magnetite, and $14.52 for the tungsten lamp. The annual fixed cost per lamp for transmitting power from the generating station to the substation 2,300-volt bus was $8.90 for the magnetite and $9.00 for the tungsten lamp. The annual fixed cost per lamp on the investment in special street-lighting equipment was $17.12 for the magnetite and $14.17 for the tungsten lamp. The summary gave the total annual cost per lamp as follows: $50.04 for the magnetite and $54.78 for the tungsten lamp. By the use of the new high-efficiency electrodes, the case for the magnetite lamp would be improved. By the use of prismatic refractors, the distribution curve for the tungsten unit would also be improved.

F. R. Mistersky, Detroit, agreed in general with the figures that Mr. Lobban had presented. The Public Lighting Commission of Detroit employs magnetite arcs for street lighting extensively and the results achieved check closely with the data cited. The study of the relative economy of the magnetite and type C lamps also gave similar conclusions. In the Detroit street-lighting system, the average life of mercury-arc-rectifier tubes is found to be 1,352 hours.

H. A. Reid, Cleveland, O., quoted some figures showing that the annual total cost for magnetite lamps was about $4 more than the new Mazda type C lamp. He said that the four-ampere magnetite lamps can be replaced to better advantage by 400-candlepower instead of 600-candlepower gas-filled lamps in order to give the same amount of light. This makes more favorable the use of the type C lamp. A valuable feature of using the latter units is adaptibility in that different sizes of these lamps can be used for different places in the city on the same standard series circuits, it being necessary to provide merely the proper compensators. In Mr. Reid's opinion refractors have been developed to such a high point that renewal thereof is necessary less than once a year and not as high as three times a year, as Mr. Lobban had thought would be required. The development of the refractor, in fact, is on a par with that of the development of the gas-filled lamp. W. J. Trott agreed with Mr. Reid as to the improved life and value of refractors. H. A. Fee said his central-station company in Adrian will replace old arc lamps with Mazda type C lamps equipped with the refractors; a higher price will be obtained for the lamps so equipped on account of the better light distribution they give.

S. A. Freshney cited a case that had recently come to his attention where a series arc generator had given after twelve years of continuous operation the low maintenance cost of only about 17 cents per lamp per year. He thought that this indicated that the old type of machine should still have a field instead of being replaced entirely by the mercury rectifiers. The question of the power-factor of magnetite-lamp installations was discussed by J. Gilmartin, J. H. Lobban and E. J. Edwards; the latter said that for a magnetite-arc circuit complete, including the substation equipment, the power-factor was about 65 per cent, whereas with the gas-filled lamps, including compensators and constant-current transformers at substation, the power-factor is 80 to 85 per cent.

President Fee and D. B. South, Detroit, then brought up the question of the need of a uniform system of rate making. This matter was discussed by H. W. Cornville, of Jackson, John A. Cavanaugh, of Benton Harbor, S. A. Freshney, F. B. Drees and others. Mr. Freshney emphasized the need for a demand rate on power customers in order to get a just return for emergency and breakdown service. He said that the rate question hinges entirely on two features. First the use of a demand rate based on, say, thirty hours' use of the demand and a low secondary rate. The latter encourages use of appliances and is the real source of profit in business. Mr. Drees agreed that it is necessary to have such a system as takes care of meeting the fixed charges through the first hour's use per day of the demand. Then a low secondary rate for prolonged use of current improves the load-factor and makes the business remunerative. He spoke of the possibility of trying out an experimental rate for any new class of customers which becomes a uniform schedule rate after one year, open to all customers in any similar class. Several speakers cited the rates which they employed and there was a general consensus of opinion that what was desired was not uniformity of rates but a uniformity of system, the exact rates depending upon local conditions.

When the question of farm lines came up for discussion J. A. Cavanaugh, Benton Harbor, spoke of the development his company has brought about in rural lines. Most of these have over twenty customers per mile and an average income of about $36 per year per customer. The average transformer installation per customer is one kilowatt. The regular residence rates are used and the same rate is made for power and lighting, with the demand based upon the number of rooms in the house. The company furnishes all of the line equipment and transformers. Single-wire lines that formerly were employed have practically all been abandoned and two or three-wire lines are now in general use.

The question was further discussed by D. B. South, H. W. Cornville and L. B. Schneider. The latter said that his plant at Tecumseh supplies farmers' lines that are tapped off from a transmission line to an adjacent town.

The branch lines are built by the company and the farmers pay two-thirds of the cost of construction; they also pay for their individual transformers. These payments, however, are a pure donation on their part, and the company owns the entire line and transformer equipment. The farmers are glad to secure the services and have contributed freely to enable them to obtain it.

On Wednesday morning a brief executive session was held at which the chief item of interest was the report by the nominating committee of a list of officers to serve for the ensuing year. These were elected as follows:

President, Samuel A. Freshney, general manager, Grand Rapids-Muskegon Power Company, Grand Rapids.

Vice-president, Thomas Chandler, Edison Sault Electric Company, Sault Ste. Marie.

Secretary and treasurer, Herbert Silvester, Edison Illuminating Company of Detroit.

Executive Committee, A. C. Marshall, Detroit; John A. Cavanaugh, Benton Harbor; A. D. Furlong, Saginaw; H. W. Cornville, Jackson; H. A. Fee, Adrian.

The Supply of the Netherlands With Electric Energy.

A special commission, which was appointed some three years ago in order to investigate the question of the rational supply and use of electric current in the Netherlands, has recently completed its report. This report is very exhaustive, and deals in a clear and comprehensive manner with the question, at the same time throwing a considerable amount of light upon the use of electric energy generally. Thus a table deals with the electric installations in several of the smaller countries:

Countries.	Area in Square Miles.	Number of Inhabitants.
Holland	12,200	6,114,000
Denmark	15,000	2,172,000
Wurtemburg	7,500	2,505,000
Switzerland	15,500	2,753,000
Belgium	11,200	7,490,000
Pavaria	29,200	6,887,000

If the number of installed kilowatts is taken at 1 per 1,000 inhabitants as a unit, the figures for the following countries are:

Bavaria	0.8
Denmark	0.9
Wurtemburg	1.5
Belgium	2.7
Switzerland	6.4

The average consumption of electric energy per inhabitant in 75 European municipalities is, respectively, for municipalities with up to 50,000 inhabitants, 29.9 kilowatt-hours; municipalities with up to 100,000 inhabitants, 56.3 kilowatt-hours; municipalities with more than 100,000 inhabitants, 68.9 kilowatt-hours. In Holland the figures for respectively, 9, 6 and 3 municipalities are 16.1, 30.9 and 42.1 kilowatt-hours per inhabitant. In Germany the average consumption per inhabitant was 30 kilowatt-hours in the year 1911, against an average of 16.2 kilowatt-hours in Holland.

In Holland there were in 1913 altogether 82 electric stations for public supply of current, viz., 24 town stations, of which 10 also supplied current to tramways, 40 private stations, 4 private tramway stations, and 14 stations or auxiliaries at industrial undertakings. The aggregate capacity of the generators was 87,500 kilowatts.

The capital invested in the above undertakings amounted to $13,400,000. The energy supplied in 1912 was:

	Kilowatt-Hours.
For lighting purposes	32,231,446
For power	32,772,792
For tramways	31,365,946
Total	97,370,184

The number of factories with an electricity supply of their own was on January 1, 1913, 1,360, with a capacity of 129,500 kilowatts, and with these were connected 7,057 motors, with a capacity of 62,984 kilowatts, while 11,049 motors, with an aggregate capacity of 36,606 kilowatts, were fed from the above mentioned 82 stations.

As regards the future probable consumption for lighting purposes, the increase appears to be fairly regular, on similar lines to that of gas. The consumption of electric current for lighting is expected shortly, or within the next few years, to amount to, respectively, 20, 15 and 8 kilowatt-hours per inhabitant in towns of more than 100,000 inhabitants, in towns with from 10,000 to 100,000 inhabitants, and in the country, making an annual consumption for the whole country of 84,787,000 kilowatt-hours.

The question as to whether industrial concerns might be disposed to discard their own supply of electric energy, and draw their requirements of current from the existing or new central stations, has also been fully gone into. A number of concerns were of opinion that the most advantageous arrangement for them would be to run their own stations regularly at their maximum yield, and only take any additional requirements from public supplies. The price for current for various branches ranged from 0.8 to 2.4 cents per kilowatt-hour. Factories with a large consumption of steam were somewhat differently situated. The result of the investigation shows that the larger industries should not pay more than 0.8 to 1.2 cents per kilowatt-hour (and at this price some of the large stations are already able to supply current), while the smaller industries probably would use electric energy even at a price of 3 to 4 cents per kilowatt-hour. The annual consumption to be expected is calculated at 170,858,000 kilowatt-hours for the larger industries and 12,151,000 kilowatt-hours for the smaller industries.

The amount of electric energy likely to be wanted for agricultural purposes is estimated at 3,690,000 kilowatt-hours, but a considerably larger amount is calculated for the many pumping stations, locks, etc., peculiar to Holland. These installations require . considerable amount of power, which is at present supplied by windmills, steam engines, motors, and several electric stations. The former represent an aggregate capacity of 6,700 kilowatts; the steam engines, etc., of 18,740 kilowatts, and the likely annual requirement of electric energy is calculated at 13,500,000 kilowatt-hours. This figure would be more than trebled should electric power also be used for the contemplated laying dry of the Zuyder-Zee, inasmuch as this is expected to demand an annual aggregate of energy of about 34,000,000 kilowatt-hours. At present there is electric traction on the Hague-Rotterdam railway and on eight tramways, but there is a question of electrifying, perhaps, a half dozen other lines where steam traction is used at present.

The future consumption of electric energy from central stations in Holland is specified as follows:

	Kilowatt-hours.
Industry	183,009,000
Lighting	84,787,000
Agriculture	3,690,000
Laying dry of land	13,394,000
Traction	36,605,000
Total	321,485,000

Dutch municipal electric stations often develop into power supply plants, but the area is not, as a rule, larger than what is covered by a radius of 10 miles; with a maximum voltage of 10,000 volts underground cables can be used without hesitation. The area can be extended by means of feeding lines and distributing stations, either with the former voltage of 10,000 volts or with a much higher voltage, say, 30,000 to 40,000 volts, which would make it possible to supply an area within a radius of, say, 35 miles on a financially satisfactory basis.

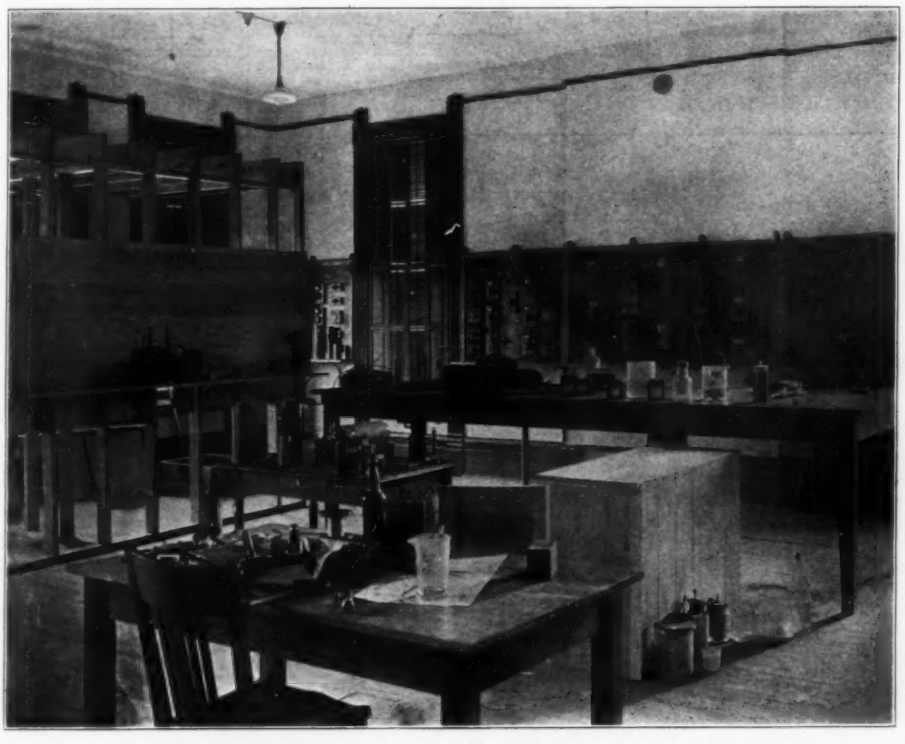
Steam is mostly used in Holland for generating electric energy; coal is the usual fuel, peat is used at one place, but does not, as a rule, answer.—*Engineering.*

All electrical signs in Baltimore, Md., must hereafter be kept lighted until 11 p. m., according to an order issued by the local Board of Estimates.

Rockford Vocational School Co-operates with Central Station in Training Employees.

One of the questions which is receiving careful consideration from central-station companies throughout the country is that of educating employees. In the larger communities, even where there is an almost unlimited supply of experienced help, utility companies have found it expedient to establish schools for training employees or in some other way to provide for the education of their men.

The Rockford (Ill.) Electric Company is particularly fortunate in this respect, in that there has recently been established there the Rockford School of Engineering, a vocational school covering not only electrical work but mechanical engineering, civil engineering, drafting and machine designing, architecture, furniture designing and other subjects.



Section of Electrical Laboratory of Rockford School of Engineering.

While the Rockford vocational school is an entirely independent institution, self-supporting in every respect, its electrical department is virtually a training school for Rockford Electric Company employees and applicants and Adam Gschwindt, vice-president and general manager of the utility, is a director of the school and very active in its affairs.

The practical electrician's course is intended to give a thorough practical and theoretical course in all the branches which an electrician must know such as wiring, trouble "shooting," armature winding, sign lighting and a general course in alternating and direct-current work. An electrical-engineering course is also available which covers, in addition to the foregoing, design of electrical machinery and general electrical engineering problems.

Experienced employees of the Rockford Electric Company assist the regular staff of instructors in the electrical department and papers and addresses are also given by representatives of manufacturers and others.

The school is open to all who pay the tuition and no guarantees are made as to positions or to employer after graduation but the growth of the electrical business in Rockford practically insures employment for graduates, either with the utility company, electrical contractors or with one of the local manufacturers. Night and day classes are held and also part-time courses, the latter enabling students to work certain days of the week while obtaining a schooling in that work. Several of the employers of Rockford have arranged for their apprentice employees to take such practical courses.

The Rockford School of Engineering has a present enrollment of over 175 students, many of whom are taking electrical courses. H. A. Taveira is director and the faculty comprises eight instructors. A partial view of the electrical laboratory is shown herewith.

Government Electric Power and Telephone System in Uruguay.

The new president of the National Power Houses Board, Señor B. Lascoity, Usina Eléctrica de Montevideo, Montevido, Uruguay, has stated the intentions of the government in regard to electric power in Uruguay. The object is to give good service to the public and to devote profits to improvement of the service and reductions of the rates. It is hoped to reduce the rate for small industries in Montevideo from 5.5 to 4.5 cents per kilowatt-hour, an advantage already enjoyed by the larger industries, as those taking power on a large scale get it for 2 cents. The board is also considering means to reduce the rate for poor people, and for employees of the power house. The present rate is 12 cents per kilowatt-hour, and a reduction of from 2 to 4 cents is anticipated.

Light and power will be extended to the principal towns. La Paz and Las Piedras are about ready. At Pando and Tacuarembo the power houses now building will be finished in four or five months. The government expects to purchase the corporation-owned power houses, and is already negotiating for those at Paysandu, Rivera, and San Jose.

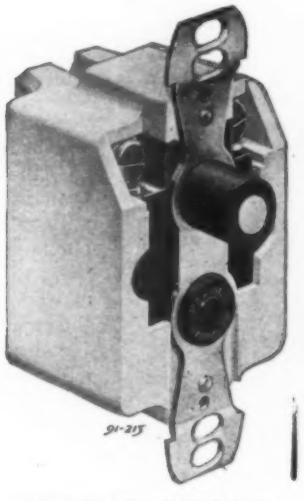
Part of the profits of the national electric light and power system will be applied to the construction of national telephone lines, which will be underground in the capital city (Montevideo) and aerial in the interior. Tenders will be called for to supply either an automatic or a manual system, and the kind of system will be decided upon after the bids are made. A double copper circuit with central-battery system will be used, and the aerial lines will also have a double copper circuit. The line will cover a wide area, embracing the capital and contiguous departments. The total cost is placed at $2,500,000.

To effect all this the governmental power house (Usina Eléctric de Montevideo) must be considerably improved. It is intended to increase its capacity with an alternating-current unit of 8,000-kilowatt rating. Another plan under consideration is to transform some of the boilers in order to burn crude petroleum, which is cheaper than coal and fluctuates less in price. It is also contemplated to electrify about ten miles of government-owned street railway.

New Electrical and Mechanical Appliances

New Push-Button Wall Switch.

The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn., has put on the market a new two-button push switch of simplified design and construction, which is known as the "Capax" switch. Every part is thoroughly substantial and of mechanically correct design. While the action of the device is positive and quick, the movement of the buttons is less than seven-sixteenths of an inch, the button which is projecting standing out only one-half inch beyond the face plate. A fiber shield, protecting the entire mechanism from dust and dirt during and after installation and until the face plate is applied, is permanently secured in position by the supporting yoke.



New Perkins Wall Switch.

The switch is rated 10 amperes, 125 volts; 5 amperes, 250 volts. It is National Electric Code standard and labeled. The "Capax" switch has been developed to enable the manufacturer to offer an exceptionally good article at the price of other competitive switches. It is not expected, however, that it will noticeably affect the sales of the higher-priced switches made by the Perkins company.

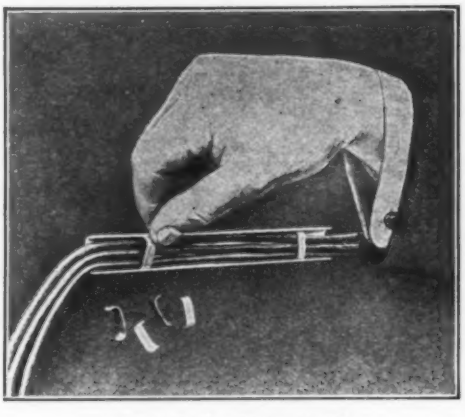
Arizona Asbestos for Electrical Insulation.

A report by the United States Geological Survey states that the asbestos which during the past year has begun to be produced in Arizona is of a high grade of fiber that compares favorably with that found in Canada. For electrical purposes it is even better than the extensively used Canadian product, for it contains a lower percentage of iron.

Edwards Wire Hold for Metal-Molding Work.

The Edwards wire hold is a unique device, one of a new line of metal-molding fittings being produced by Edwards & Company, Incorporated, 140th and Exterior Streets, New York City, under the patent granted to James Stewart.

The wire hold is a small spring-steel article formed to fit inside the base of metal molding into which it snaps with very slight pressure, and securely holds the wires (two or three, as the case may be) in position, so that both hands of the workman are free to apply the capping to the base. The wire hold is so small that it may be left inside the molding when the capping is put on, without interfering in any way with that operation.



Wire Hold for Metal Molding.

To those who use metal molding the new wire hold will prove itself of great advantage not only in the efficiency and facility which it assures, but also in the economy of time and labor which its use affords. On ceiling and side-wall runs, the difficulty of applying the capping and at the same time holding the wires in position is well realized by those familiar with this type of installation. The new device does away with this difficulty. Where two men are usually required to wire the molding and apply the capping, the wire hold reduces the work to a one-man job. Furthermore, by the use of this simple and inexpensive wire hold, a job may be wired completely before the capping is put on, the wires being left exposed for inspection if desired.

Combined Snap Switch and Separable Attachment Plug.

A combined snap switch and separable attachment plug, a device designed especially for increasing the flexibility of fan-motor control, has recently been marketed by the General Electric Company. The separable cap consists of a single-pole snap switch with two finger contacts which fit into the body of a separable attachment plug. The plug, in turn, is screwed into any available socket or receptacle, and from this point, the fan or other portable appliance can be turned on or off. In some cases this additional point of control is of great convenience. The switch cap may also be used without the attachment plug, as the finger contacts fit any standard General Electric separable receptacles.

Attachment Plug With Snap Switch.

New Electric, Tankless Air-Pressure and Vacuum Outfit.

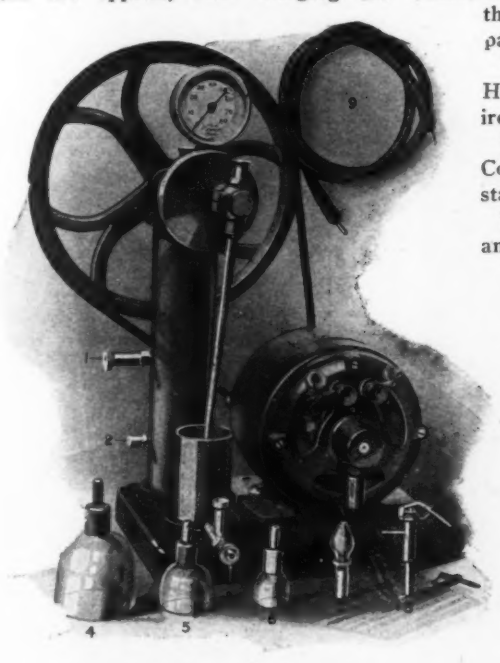
This outfit is made for air-pressure and vacuum service in doctors' and dentists' office. The principal advantage of the outfit is that no pressure tank is required and the outfit there-

fore requires very little space. The total bench or floor space required is 7 by 9 inches and the overall height is 16 inches.

The outfit is started and stopped as the air service is required, the various attachments being connected directly to the pump. It is equipped with a one-tenth horsepower motor, alternating or direct current, supplied by the Robbins & Myers Company, Springfield, O. The motor is started and stopped by a foot switch.

All parts of the machine except the base and motor are of nickel finish. The motor and base are finished in black japan.

In using the machine for massage treatment alternate pressure and suction are applied, thus bringing the blood to the surface as well as supplying vibration.



Direct-Acting Air-Pressure and Vacuum Outfit.

In the illustration *1* is the pressure regulating valve; *2* is the connection for air pressure; *3* is the connection for vacuum; *4*, *5* and *6* are cups for general massage, cupping and hyperemia; *7* is the nozzle for nasal and ear massage; *8* is the automatic cutoff valve for pressure, and 9 is the tube for connecting the pump and attachments.

The outfit is furnished complete with the above attachments, cord, plug and motor. It is manufactured by the Engeln Electric Company, Cleveland, O.

High Honors Awarded Western Electric Products at Exposition.

The International Jury of Award of the Panama-Pacific International Exposition announces that it has awarded the following medals to the Western Electric Company.

The Grand Prix for the exhibit as a whole.

Gold medals, each were awarded as follows:

One for telephone switchboards and equipment.

Another for telephone train dispatching and control apparatus.

A third for insulated wires and cables.

Two bronze medals were awarded for the company's mine rescue equipment and mine telephones.

The following silver medals were awarded to manufacturers of electrical devices, with the distribution of whose products the Western Electric Company is closely identified. These companies had their products displayed in the Western Electric Company's exhibit.

To the American Electrical Heater Company for electric irons.

To the Gray Pay Station Company for telephone pay stations.

To Edwards & Company for annunciators.

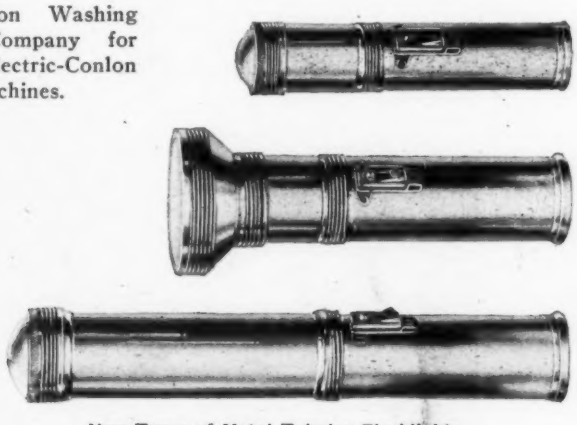
To Conlon Washing Machine Company for Western Electric-Conlon washing machines.

Metal Tubular Flashlight.

A new line of metal tubular electric flashlights has recently appeared on the market. These are said to have several superior features. They are particularly durable, the cases being drawn from solid sheet brass. The lower piece telescopes the upper near the center. This insures maximum strength and permits engaging the screw threads without effort, an obvious advantage over the old, aggravating method of attempting to screw on a small end cap with a spring in it. The construction is such as to eliminate the danger of short-circuiting the battery.

The lens is secured by a separate screw end ring. This allows a broken lens to be replaced without procuring an entire new head. Five different sizes of the new flashlight are made, and each is offered in the following finishes: heavy polished nickel, gun metal and statuary bronze.

The metal tubular flashlight briefly described and illustrated above is but one of the many styles of "Kwik-lite" flashlights and battery lanterns now being manufactured by the Usona Manufacturing Company, 1 Hudson Street, New York City, and 309 South St. Clair Street, Toledo, O. The company manufactures 65 different kinds and finishes of flashlights and lanterns, together with a full line of "Kwik-lite" batteries and Mazda flashlight lamps.



New Types of Metal Tubular Flashlights.

Outdoor Switch Houses.

Outdoor substations have made necessary an outdoor type of switching and metering equipment to control and measure their output satisfactorily. As economy and simplicity are generally the determining features in the selection of this type of substation, conditions call for an efficient, yet compact and inexpensive, equipment to be provided for the low-tension circuit. Primarily intended for outdoor mounting, the exposed location demands a housing that is weatherproof and at the same time affords protection to the apparatus contained therein against marauders or unauthorized persons.

To meet this demand, the Westinghouse Electric & Manufacturing Company has developed a line of outdoor switch houses filling the requirements outlined above. Two designs have been developed, one for pole, wall or tower mounting is illustrated in Fig. 1; the design shown in Fig. 2 is intended for mounting on the ground. The idea of simplicity has been kept foremost in working out these designs.

The housing of both types consists of sheet steel, built up on structural steel framework with a large door in front to permit ready access to the apparatus. All the apparatus contained within the switch house is accessible from the front, and it is not

necessary to remove the back of the house in order to get at any of the apparatus or wiring.

The switching equipment consists of a full-automatic, self-contained, series-tripping, oil circuit-breaker mounted directly on the steel framework of the house. This eliminates the necessity of a slate panel for mounting the breaker and its operating handle. Such a panel is objectionable, as it involves the necessity of a door for the back of the house in order to remove the tank of the breaker or to properly inspect the apparatus. Another feature made possible by the use of this breaker is the decreased depth of the house over that required in one using switchboard-mounted breakers; approximately 18 inches being saved.

The metering equipment consists of a standard house-type polyphase watt-hour meter together with the necessary current and voltage transformers, fuse blocks and fuses. The meter is mounted on a small slate panel on which are also placed the necessary current and voltage terminals provided for the connection of the operating company's testing and calibrating meters. In the house illustrated in Fig. 2, two single-phase watt-hour meters are used in place of a polyphase meter.

"Safety First" has also been considered, the voltage transformers being mounted in such a manner and all other voltage leads placed in such a way that accidental contact with them is impossible. The inlet and outlet bushings are placed high enough above ground to prevent the possibility of any one coming in contact with the incoming or outgoing leads.

The pole-mounting feature of the switch house in Fig. 1 is claimed as an exclusive feature. Eliminating the necessity of removing the back makes it possible to install this house on hanger irons for pole-mounting in the same manner as a transformer, the approximate weight being about 600 pounds. It may also be mounted on steel towers which method is being rapidly adopted by a great number of operating companies. The switch house is also adapted for mounting on a wall in proximity to the apparatus controlled.

These houses are shipped completely wired and equipped ready for service with the exception of mounting the watt-hour meter and filling the breaker tanks with oil, so that the only work necessary after arrival at destination is to perform these two operations, connect the incoming and outgoing leads, and the outfit is ready for service.

A complete line of these switch houses is now available of either type in any capacity up to 300 amperes, 2,200 volts and 4,500 volts.

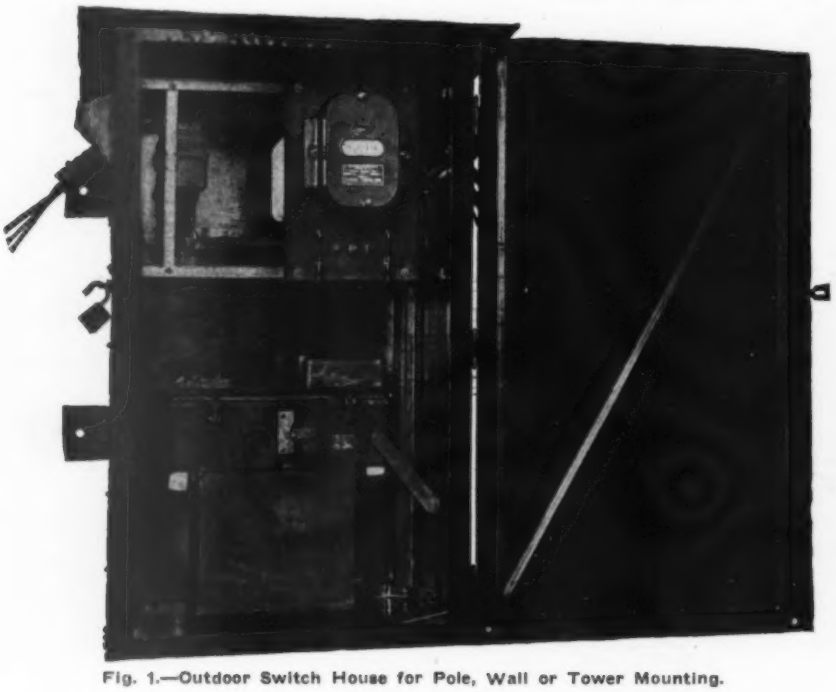


Fig. 1.—Outdoor Switch House for Pole, Wall or Tower Mounting.

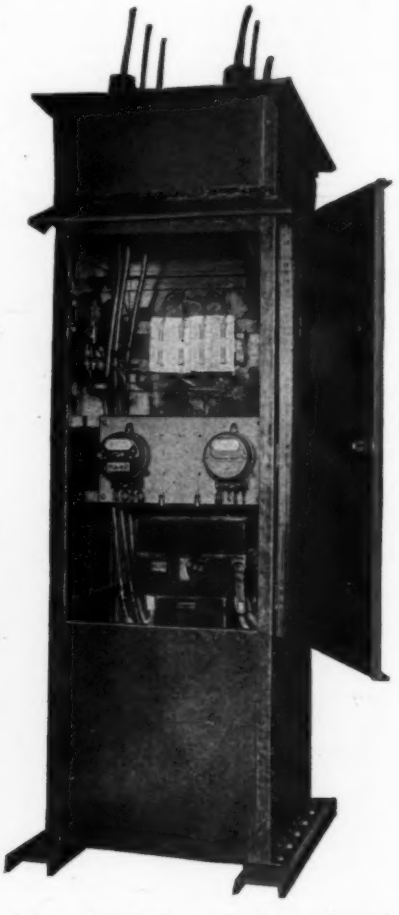


Fig. 2.—Switch House for Use on Ground.

Copper Deposits of Ketchikan.

The copper deposits of the Ketchikan district, southeastern Alaska, were known to the Russians before the acquisition of the Territory by the United States, and there was a crude attempt to develop them as early as 1880. It was not until 1901, however that systematic mining was begun and not until 1905 that a large annual output was made. Up to the close of 1913 the copper mines of the Ketchikan district had produced about 22,640,000 pounds of copper, valued at $3,760,000, and about $500,000 worth of gold and silver.

Most of the mines of the district lie at or near tidewater. There is an abundance of timber, and the relief favors the undercutting of the ore bodies. While there are as yet only a few producing mines, there are many undeveloped copper prospects which give promise of containing commercial ore bodies. Many of the copper deposits show an irregularity of occurrence that is unfavorable to cheap exploitation, but otherwise the conditions are favorable to low mining costs.

Improved Industrial-Type Oil Switch.

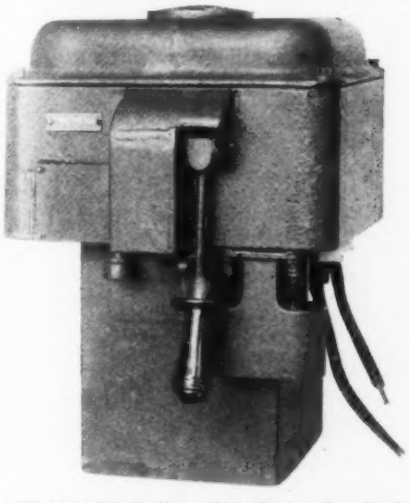
The type of oil switch illustrated herewith, is used extensively in industrial establishments to control and protect induction motors up to 2,500 volts and 300 amperes. It can be mounted on a wall, post or other vertical flat surface, or by means of suitable supports on the machine operated by the motor. The switch is made by the General Electric Company in both non-automatic and automatic forms; the first is used simply like an ordinary switch to start and stop the motor, and the second as a starting and circuit-breaker to cut off current from

the motor automatically on the occurrence of an overload.

Through a recent improvement in the design of the mechanism, a low-voltage trip can be added to the automatic switch as an attachment at any time. To the non-automatic switch, either a low-voltage trip or a series-overload trip, or both, can be added whenever desired.

Up to 550 volts (except on 110-volt, 60-cycle circuits, where the trip coil alone is sufficient), an autotransformer is used in place of the resistance previously required in series with the low-voltage tripping coil. This transformer has taps to which proper connections can be made for the operating voltage. For 2,200-volt circuits, a new type of voltage transformer replaces the transformer and series resistance used heretofore. The use of the new autotransformer, or voltage transformer, makes the watt loss in the low-voltage device practically negligible.

Switches can also be furnished with



2,500-Volt Oil Switch With Series Overload and No-Voltage Release.

covers arranged to mount a round-pattern ammeter and thus provide, in addition to control and protection, a means of knowing at all times the amount of current taken by the motor.

Fargo Connecting Devices.

The accompanying illustrations show three of the connecting devices made by the Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y. Fig. 2 shows the Fargo grounding device, which eliminates the use of bolts and nuts, providing a permanent and reliable ground. This grounding device establishes a positive connection, the wires being locked together, forming a joint of high conductivity. The ease of installation of this grounding device makes it a great time-saver, and the simplicity of construction enables it to be manufactured and installed at a low cost.

Fig. 1.—Straight Connector.

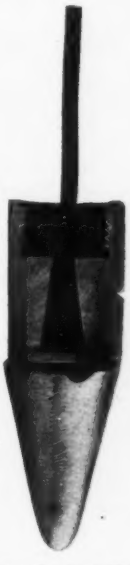


Fig. 2.—Ground Device.

Fig. 3.—Cable Lug.

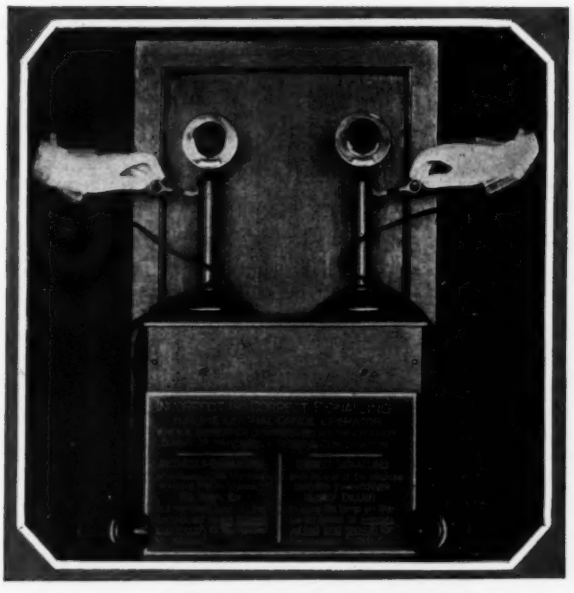
Fig. 1 shows the straight-type connector This connector establishes a joint of low resistance, the gripping part having three times the cross section of the wire or cable.

Fig. 3 shows the cable lug.

These devices all establish an intimate metallic contact, the joints having an extremely low resistance. They depend upon the principle of reciprocating conical wedges so disposed that as the strain increases the greater is the gripping effort of the connecting devices.

Instructive Telephone Window Display.

An electrically operated demonstration of the right and the wrong way to call central operator, once a telephone call has been made, is on exhibition at the Tremont Street commercial branch office of the New England Telephone & Telegraph Company, Boston, Mass.



Effective Telephone Demonstration.

In the window is displayed a cabinet about 3 feet high and 2 feet 9 inches wide, made of oak frame and back, with red plush sides through which a plaster of paris hand protrudes from either side and touches the switch hook of two telephone desk sets which are on a shelf, beneath which are ruby switchboard lights.

In the box under the cabinet is located a one-third-horsepower motor, which operates eccentrics that lift and lower the two hands. The hand at the left is operated fast, and the other hand slowly, denoting the proper and improper manner of calling "Central's" attention. At the same time, the switchboard lights flash quickly and slowly, respectively, evidencing to the public that the slow way is the right way to operate the hook.

Current Electrical News

ATLANTIC STATES.

SOUTH NORWALK, CONN.—A new ornamental street-lighting system is being considered, to consist of combination poles with arms to support tungsten lamps and an extension to carry electric railway wires. The city is considering the purchase of a 250-kilowatt motor-generator set for conversion of 11,000-volt alternating current to 230 volts direct current.

BRIDGETON, N. J.—The Ferracute Machine Company will shortly begin the erection of a new building at their plant here.

BETHLEHEM, PA.—The Catholic Church of the Holy Ghost will erect a $50,000 church and orphanage here.

SPRING HOPE, N. C.—The Eastern Carolina Light and Power Company will construct a hydroelectric plant on Tar River, three miles from Spring Hope, and electrical transmission systems to several towns, and will ultimately develop 2,000-horsepower.

NORTH CENTRAL STATES.

ATHENS, O.—The Athens Electric Company has increasd its capital stock from $10,000 to $75,000.

CANTON, O.—The lighting committee of the City Council is considering plans for the type of posts and other details of the street-lighting system to be installed, which may be extended to a number of streets not at first to be improved. Residents have petitioned for the new system on their streets, and it may be found possible to extend the system. L.

CINCINNATI, O.—The extensive use of electricity and electrical equipment on one of the largest construction jobs handled here for several years is proposed by the Charles McCaul Company, which has the contract for the building of the new courthouse. All machinery which can be electrically operated will be arranged for motor drive, the company believing that the elimination of smoke and the other advantages resulting from the use of electricity will be sufficiently important. L.

CINCINNATI, O.—The power house at Ohio River Dam No. 29 will probably be constructed and equipped by Geo. W. Ward & Son, of Ashland, Ky., on their low bid of $18,777. The bids are in the hands of the War Department, with a recommendation in favor of the concern named. L.

SPRINGFIELD, O.—About $15,500 will be expended by the city in the installation of a boulevard lighting system for a number of streets in the central part of the city, plans and estimates having been approved by the City Commission. Items estimated include posts (294), $7,056; globes, $1,764; lamps, $449.82; cable, $7,711; installation and wiring, $1,470. L.

CANTON, ILL.—Members of the City Council are considering the installation of a municipal electric light plant at the waterworks. City Engineer Brickner is making an estimate on the cost and plans showing the distributing system.

OREGON, ILL.—Arrangements are being made to install a new system of lighting. Address Mayor.

WESTBY, WIS.—The contract has been awarded and work started on a municipal electric plant. Address E. E. Dillion, constructing engineer, Madison, Wis.

CLOQUET, MINN.—Bids on the fire alarm and signal system of the new fire hall were rejected at a meeting of the Council June 22. Councilman Yetka has made an examination of the Duluth fire alarm system and will report and make recommendations to the Council. A desirable system, it is thought, will cost about $5,000. X.

COLERAINE, MINN.—Work on the high-tension transmission line of the Great Northern Power Company, from Nashwauk to this village, is in progress, and it is expected that within a month Coleraine will receive power and light from Virginia. X.

LAKEFIELD, MINN.—This village has voted $31,000 worth of bonds for the construction of an electric light and power plant. X.

MENAGHA, MINN.—B. Gunderson, of Park Rapids, Minn., is investigating the feasibility of installing an electric light and power plant here. X.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company is to supply power and light to Osseo, Rockford, Deleno, Watertown, St. Bonifacius and Waconia by means of a trunk-line extension from the Coon Rapids power dam. The line will be completed by November 1, and will have an aggregate length of 65 miles. In Osseo the distribution will be by the General Electric Company, but in the other towns the current will be wholesaled to local companies.

FREDERICKSBURG, IOWA.—The citizens have voted in favor of a bond issue for an electric lighting plant. Address City Clerk.

FULLERTON, NEBR.—A bond issue of $28,000 was voted for the establishment of an electric light and power plant. Address City Clerk.

GOFF, KANS.—The town is agitating the calling of an election to vote bonds for the purpose of establishing an electric light system. It is planned to build a 12-mile transmission line from Corning, and Soldier promoters promise to stand half the expense. Address City Clerk.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—In order to be able to make extensions of its service, under the usual regulations, at will, inside Jefferson county, outside the city of Louisville, the Louisville Gas and Electric Company has asked for a franchise covering the whole county. Several transmission wires extend out into the county now, but whenever it is desired to run service wires from them, if these wires cross a public road, it is necessary to get special permission to construct it. It is to obviate this troublesome formality that the franchise is asked for. The Fiscal Court is expected to grant the right to do business outside the city, an upset price of $100 having been set on it. This does not indicate an immediate extension of service all over the county, though it would enable the company readily to supply service wherever it was demanded.

LOUISVILLE, KY.—Electrical contractors of Louisville are looking forward with considerable interest to the award of the contract for construction of the $300,000 Y. M. C. A. building, at Second Street and Broadway. The general contractors' bids are in but not as yet awarded. John Bacon Hutchings is the architect.

MAYSVILLE, KY.—G. A. Hill & Company, of Maysville, have been awarded the contract for electric wiring and fixture installations for the new public school house at Ripley, Ky.

OWENSBORO, KY.—The City Council has voted to supply electric current from the municipal power plant free to those who will install and maintain "white way" standards in Frederica and Second Streets. A previous installation has been allowed to deteriorate, but on the signed promises of property owners to keep the posts and globes in repair and lamps burning, the Council has renewed the free offer of current.

BENTON, TENN.—By the terms of an agreement reached between the local Chamber of Commerce and W. F. Hoover, vice-president of the Tennessee Power Company, Benton is to be given an electric light service. The company will make the surveys and install the lines while the community supplies the rights of way. Mayor Copeland and a committee are making final arrangements with the company.

DANDRIDGE, TENN.—A bond issue of $10,000 to construct an electric light plant is under consideration here. The Mayor is directing the project.

MARYVILLE, TENN.—Specifications have been issued by Mayor Sam Everett, and R. C. Huston & Company, engineers, of Memphis, for a municipal water system, calling for alternate bids for electric-driven units to operate from deep wells.

WAVERLY, TENN.—Slayden & McNabb have asked for prices on electric wiring for a $6,000 residence at Scottsville, Ky.

BOSWELL, OKLA.—The city will build an electric light plant to cost about $14,000. Bonds have been issued for the purpose. D.

BARTLETT, TEX.—The electric light plant has been sold to the Texas Light and Power Company, of Dallas, for the sum of $22,000. The company has been granted a fifty-year franchise, and will take possession of the plant on September 1.

DALLAS, TEX.—At a called meeting of the board of directors of the Texas Power and Light Company, favorable action was taken on a proposition to vote $140,000 additional bonds to be used in making improvements and extensions of the company's properties. Address J. F. Strickland, president.

DENISON, TEX.—The Texas Power and Light Company will build a big power plant in Denison. Address R. B. Sticher, general manager of the Texas Traction Company.

VICTORIA, TEX.—Steps will be taken soon to construct a municipal electric light plant here to cost $40,000. Bonds have been issued and approved by the Attorney General's Department for the purpose. D.

WESTERN STATES.

ANACONDA, MONT.—The City Council has passed a resolution of intention creating Improvement District 65, including Hickory, Locust and Maple Streets, and cross streets in the district; also Improvement District 64, including Main Street, above Third Street, wherein an up-to-date lighting system is to be installed. O.

PRESCOTT, ARIZ.—The Arizona Power Company will use the proceeds of the $200,000 bonds which it recently issued for constructing a second hydroelectric plant on Fossil Creek, near here. The new plant, in connection with the one which the company already operates on Fossil Creek, 48 miles from Prescott, will be used to supply power for industries in Prescott and other towns and communities of this region. They will also supply electrical energy to the Prescott Gas and Electric Company, a subsidiary concern. D.

BLACKFOOT, IDAHO.—The City Council has announced its intention of investigating several available water power sites with the view of installing a municipal lighting and power plant. A majority of the members of the council, as well as influential business men, favor the proposition. O.

COEUR D'ALENE, IDAHO.—The City Council has instructed the light committee to apply to the Idaho Public Utilities Commission for permission to construct and operate a municipal electric light and power plant.

GRACE, IDAHO.—W. A. Kraner & Co., Chamber of Commerce Building, Portland, Ore., has been awarded the contract for the penstocks in connection with the 15,000-horsepower hydroelectric development of the Utah Light and Power Company here. The contract will include the erection of 1,000 tons of plate steel, seven and one-half feet in diameter penstocks, to operate under a 500-foot headway, and for the installation of a Butterfly gatevalve, Ys., etc. Work on the project, it is understood, will be started as soon as materials can be placed on the ground. O.

MISSION CITY, B. C.—Reported property owners on July 20 will make application for the creation of a rural street lighting district on the local improvement system. Alexander Stephens, et al., here, are back of the proposition, which entails the expenditure of several thousand dollars. O.

BEND, ORE.—This city on August 4 will vote on the proposition of granting an electric light and power franchise to the Steidl-Tweet Company. If same is granted the company plans the expenditure of thousands of dollars in Bend and vicinity. O.

EUGENE, ORE.—The proposition of installing a steam electric auxiliary of 1,250 kilowatts to the present municipal power plant, is being considered by the Council. The present plant consists of two 700-kilowatt generators. Estimates, specifications and tentative plans have been presented to the City Council who, as a whole, favor making the improvement. O.

MEDFORD, ORE.—The City Council here has been petitioned by the Rogue River Public Service Corporation for a light and power franchise. The light committee has recommended that the Council grant the petition. O.

PRAIRIE CITY, ORE.—The Prairie City Light Company, according to reports, will start within the next few weeks on the construction of a $50,000 light plant; according to report, machinery has been ordered for the power house, which will have an 800 horsepower capacity. Water will be conveyed from the river at a point near the present power house, about three miles above Prairie City. O.

SEASIDE, ORE.—This city has entered into a contract with the Pacific Light and Power Company, of Portland, whereby a system of streamer lights will be installed the entire length of Broadway, leading to the beach. Several blocks of cross streets in the business portion of the city will be illuminated in the same manner. Installation will be made as soon as materials and equipment can be purchased. O.

COLVILLE, WASH.—The Stevens County Light and Power Company recently leased a large power site at Myers Falls, owned by George E. Myers, of Spokane, and according to all reports, will construct a large power plant on the site in the immediate future. Current to be generated will be sold to Colville, Kettle Falls and other small towns in Stevens County. O.

ELLENSBURG WASH.—The County Commissioners of Kittitas County, have been petitioned by the Pacific Telephone and Telegraph Company, head offices in San Francisco, for a franchise to construct, maintain and operate telephone lines along county roads in Kittitas County. O.

ELLENSBURG, WASH.—The County Commissioners, Kittitas County, have been petitioned by R. N. Bull, of Ellensburg, for a 50-year franchise for the right to construct, equip and maintain electric power and transmission lines along certain highways in Kittitas County. It is reported Mr. Bull and associates will spend thousands of dollars in constructing transmission lines throughout the county, active construction to begin as soon as the franchise is granted. O.

LANGLEY, WASH.—H. E. Wood, electrical engineer, Prince Rupert, B. C., is reported to be investigating the feasibility of constructing an electric lighting and power plant here, to furnish current for illuminating Langley and contiguous territory. O.

METALINE FALLS, WASH.—The Engineering firm of Hugh L. Cooper & Company, New York City, which was recently retained by eastern capitalists to make an exhaustive study and examination of the engineering and commercial possibilities of the so-called Z-Canyon Water power, on the Pend O'Reille River, near this city, has established a branch engineering office and camp in Metaline Falls, same being in charge of D. R. Cooper. At present, the engineering party is making a careful measurement of the stream flow at Metaline Falls, checking up the rating flow curves, and drilling exploration shafts, tunnels and test pits at the selected dam and power house sites.

MONTESANO, WASH.—The City Commission has indefinitely postponed action on the application of George H. Tilden, and associates, of Seattle, for electric light and power franchise, which was petitioned for some time ago. No doubt, their action was the result of refusal of other cities in the Grays Harbor country to grant a similar request. O.

MORTON, WASH.—The County Commissioners have granted a franchise to C. O. Smith to extend the service of the Morton Electric Company over all roads leading out of Morton.

OKANOGAN, WASH.—The Okanogan County Commissioners, F. A. Grainger, auditor, have granted to H. I. Stoolfire, of the Arlington Mining Corporation, a franchise to construct a power transmission line from the plant of the Okanogan Valley Power Company here to the Arlington mines. J. B. Ingersoll, of the Spokane & Inland Electric Company, will have entire charge of construction work, which will be started as soon as materials can be placed on the ground. According to reports, a considerable amount of electrical equipment will be installed in the mines this year. An electric tram for handling ore is also considered. O.

OLYMPIA, WASH.—The sum of $60,000 will be expended for the erection of a municipal light plant. Address mayor.

PORT ANGELES, WASH.—Board of County Commissioners, Clallam County, have granted a franchise for the erection and operation of an electrical transmission line for distribution of electrical energy for lighting and power purposes, along the highway between Sequim, Dungeness and Fort Williams, to J. L. Keeler, of Sequim. It is understood construction will begin in the near future. O.

SEATTLE, WASH.—The Board of King County Commissioners, at a recent meeting, granted to the Puget Sound Traction, Light and Power Company, of Seattle, a franchise for furnishing light and power to Mercer Island. At the same meeting, Commissioners also granted a franchise for similar purpose to Glenville A. Collins, L. C. Smith Building, Seattle. The Puget Sound Traction, Light and Power Company announces immediate construction, and Mr. Collins and associates, according to terms of franchise, must begin work within 60 days.

YARDLEY, WASH.—An electric lighting system is to be installed on the principal streets and arc lights on business corners by the Washington Water Power Company, of Spokane. Reported the installation will be made at once. O.

CHICO, CAL.—Plans have been presented to the city trustees for the installation of an ornamental lighting system in the business district of this city.

LOS ANGELES, CAL.—Sealed bids are being taken by the Board of Supervisors for the installation and maintenance of a street lighting system in the Angeles-Mesa Lighting District.

LOYALTON, CAL.—City officials are preparing to call a special election to submit the question of voting bonds for a municipal light plant to cost $3,200.

RIVERBANK, CAL.—The Pacific Fire Extinguisher Company, of San Francisco, has been awarded the contract for the installation of a lighting system here for $4,185.

FINANCIAL NOTES.

Stockholders of the Camaguey Electric Company voted to give a 90-day option to the Electric Bond & Share Company to purchase at 50 per cent of par value the company's $1,000,000 capital stock.

Directors of Texas Power & Light Company have voted to issue an additional $140,000 bonds to provide for improvements at Sherman, Waco and Denison.

American Gas & Electric Company is offering at 97.5 and interest an additional $500,000 of its six-per-cent 100-year debenture bonds dated May 1, 1914, making the total issue now outstanding $1,500,000.

Dividends.

	Term.	Rate.	Payable.
Am. Pub. Serv. pf.	Q	1.75%	July 1
Aurora, Elg. & Chi. pf.	Q	1.5 %	July 1
Bell Tel. of Pa.	Q	1.5 %	July 15
Cent. & So. Am. Tel.	Q	1.5 %	July 9
Chi. City & C. Rys. pf.	S	$1.25	July 1
Cin., Newport & Cov. Lt. & Trac. pf.	Q	1.125%	July 15
Cin., Newport & Cov. Lt. & Trac. com.	Q	1.5 %	July 15
Elec. Lt. & Pr. of Ab. & Rockland	S	$4.00	July 1
Elmira Water, Lt. & R. R., 1st pf.	Q	1.75%	July 1
Harrisburg Lt. & Pr. pf.	Q	1.5 %	June 30
Interstate Rys. pf.	S	30c	July 1
Kaminestiquia Pr.	Q	1.5 %	Aug. 16
Mass. Ltg. pf.	Q	$1.50	July 1
Mass. Ltg. old com.	Q	$1.75	July 1
Mass. Ltg. new com.	Q	25c	July 1
Mex. Teleg.	Q	2.5 %	July 16
Mont. Lt., Ht. & Pr.	Q	2.5 %	Aug. 16
Mont. Tel.	Q	3 %	July 15
Mountain Sts. Tel.&Tel.	Q	1.75%	July 15
Omaha & Coun. B. St. Ry. com.	Q	1 %	July 1
Pac. Tel. & Tel.	Q	$1.50	July 15
Phila. Co. com.	Q	1.5 %	Aug. 2
Porto Rico Rys.	Q	1.75%	July 2
So. Cal. Edison pf.	Q	$1.50	July 15
Un. Gas. & Elec. pf.	S	2.5 %	July 15
Winnipeg Ry.	Q	2.5 %	July 2

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

	1915	1914
May gross	$1,525,189	$1,368,892
Net after taxes	779,763	642,156
Surplus after charges	428,933	250,220
Five months' gross	7,749,538	7,070,229
Net after taxes	4,105,658	3,523,326
Surplus after charges	2,294,263	1,561,898

After providing for depreciation and dividends on the preferred stocks, the balance for the common stock for the five months was at an annual rate of 9.70 per cent.

WISCONSIN EDISON COMPANY.

	1915
May gross	$ 672,826
Operating expenses	423,436
Net earnings	249,390
Balance available for depreciation and holding company	111,988
Twelve months' gross	8,541,582
Operating expense	5,052,582
Net earnings	3,488,999
Balance available for depreciation and holding company	1,861,326

The appropriation for depreciation of operated properties for the 12 months ended May 31, 1915, was $885,142, an increase of 3.94 per cent over the appropriation for the preceding 12 months.

SOUTHERN CALIFORNIA EDISON.

	1915	1914
May gross	$ 373,356	$ 387,516
Net after taxes	200,382	212,158
Surplus after charges	117,908	135,946
Balance after depreciation	77,908	75,947
Five months' gross	1,880,849	1,910,500
Net after taxes	1,029,044	916,333
Srrplus after charges	620,675	538,894
Balance after depreciation	391,675	378,894

BRAZILIAN TRACTION, LIGHT & POWER.
(Earnings in Milreis.)

	1915	1914
April gross	$ 6,333,460	$ 5,941,220
Operating expenses	2,627,690	2,578,680
Net earnings	3,705,770	3,382,540
Four months' gross	24,422,060	24,074,458
Net earnings	14,054,670	13,688,658

CONSUMERS POWER OF MICHIGAN.

	1915
May gross	$ 289,562
Net earnings	197,140
Surplus after charges	102,842
Balance after preferred dividends	69,342
Five months' gross	1,522,067
Net earnings	1,053,732
Surplus after charges	576,761
Balance after preferred dividends	409,261
Twelve months' gross	3,511,901
Net earnings	2,317,298
Surplus after charges	1,179,992
Balance after preferred dividends	795,492

REPUBLIC RAILWAY & LIGHT.

	1915	1914
May gross	$ 247,644	$ 256,325
Net after taxes	99,019	96,861
Surplus after charges	42,239	40,407
Balance after preferred dividends	16,282	14,450
Five months' gross	1,210,228	1,247,905
Net after taxes	455,418	470,471
Surplus after charges	171,132	191,284
Balance after preferred dividends	41,347	61,499

PROPOSALS.

FIRE STATION.—Separate bids will be received till July 19, for the electric work on a fire station and city hall at Detroit, Minn. Proposals must be accompanied by certified check for five per cent of bid. Address, E. J. Bestick, City Clerk. Plans in the office of C. E. Bell, architect, Minneapolis. X.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 13, for furnishing 200 storage batteries, Schedule 8513, f. o. b. Works; 600 receiver cords and miscellaneous twin conductor wire, Schedule 8525, both for delivery at Navy Yard, Brooklyn, N. Y.; one three-unit, six-bearing motor generator set, Schedule 8509, for delivery at Navy Yard, Annapolis, Md.; two 200-kilowatt generating sets, Schedule 8511, for delivery at Navy Yard, Philadelphia, Pa.; four five-kilowatt turbo-generator sets, Schedule 8511, for delivery at Navy Yard, Norfolk, Va.; three 50-kilowatt transformers, Schedule 8512, for delivery at Navy Yard, Norfolk, Va.

ELECTRIC LIGHT PLANT EQUIPMENT.—Sealed proposals will be received by the secretary of the Board of Public Works, Chillicothe, Mo., July 15, for furnishing machinery, materials and labor required to make certain extensions and improvements at the electric light plant. Work consists of furnishing and erecting one direct-connected steam engine and generator, 375 kilovolt-amperes, three-phase, 60-cycle, 2,300 volts; or one turbine-driven unit of the same size. Furnishing and erecting one turbine-driven exciter for above generator; alternate bid on motor driven exciter. Furnished f. o. b. cars, one switchboard panel and instruments, and one power-circuit panel and instruments. Furnishing one 500 gallons-per-minute centrifugal pump, with motor; one 12-inch barometric condenser; one 12-inch horizontal oil separator. Furnishing pipe, valves, fittings and installing pump and condenser. Complete plans and specifications are on file with Board of Public Works, or may be seen at the office of the consulting engineers, Harper & Stiles, 914-15 Grand Avenue Temple, Kansas City, Mo. Address C. F. Adams, President of the Board of Public Works, Chillicothe.

NEW CORPORATIONS.

NEW YORK, N. Y.—Metropolitan Wiring Company, Incorporated. To do electric wiring, etc.; capital, $5,000. Incorporators: Abraham Greenblatt and A. M. Leving, of New York City, and Herman B. Levine, of Brooklyn, N. Y.

NEW YORK, N. Y.—Gertler Electric Company, Incorporated. Electrical construction, etc.; capital, $5,000. Incorporators: Carrie Gertler and Nathan G. Gertler, of New York City, and Rose Markowitz, of Brooklyn, N. Y.

LOND ISLAND CITY, N. Y.—Comet Storage Battery Company, Incorporated. To Manufacture electrical apparatus, storage batteries, etc.; capital, $10,000. Incorporators: Gustav Kiel, Hugo Kiel and Jay A. Hurst.

PERSONAL MENTION.

M. L. HIBBARD, general manager of the Union Light, Heat & Power Company, Fargo, N. D., has been elected a member of the House Committee of the Fargo Commercial Club.

MR. GEORGE A. ARNOLD, formerly manager of the Chicago district for the Lincoln Electric Company, of Cleveland, Ohio, has accepted the position of general sales manager of the American Rotary Valve Company of Anderson, Ind.

E. F. STONE, superintendent of light and power of the Arkansas Valley Railway Light & Power Company, Pueblo, Colo., has been elected a vice-president and director of the Pueblo Commerce Club. Mr. Stone has been chairman of the Manufacturers' Bureau of the club for some time and will continue in that capacity also.

MR. WILLIAM T. GUNNISON, of Rochester, has been appointed and confirmed as a member of the New Hampshire Public Service Commission, to succeed John E. Benton, whose term expired recently. Mr. Gunnison is a law partner of former Governor Felker and is at present judge of the local court at Rochester. Mr. Benton was nominated for reappointment by Governor Spaulding, but failed of confirmation.

MR. CARL PFANSTIEHL, president of the Pfanstiehl Company, North Chi-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 28.	June 21.
American Tel. & Tel. (New York)	123¾	123½
Commonwealth Edison (Chicago)	134	134
Edison Electric Illuminating (Boston)	237	237
Electric Storage Battery, common (Philadelphia)	52½	54¾
Electric Storage Battery, preferred (Philadelphia)	52½	54¾
General Electric (New York)	171	172
Kings County Electric (New York)	119	23¾
Massachusetts Electric, common (Boston)	5¾	79
Massachusetts Electric, preferred stamped (Boston)	36	65
National Carbon, common (Chicago)	140	66½
National Carbon, preferred (Chicago)	117	97
New England Telephone (Boston)	129	125
Philadelphia Electric (Philadelphia)	23½	119
Postal Telegraph and Cables, common (New York)	79	79
Postal Telegraph and Cables, preferred (New York)	64	36½
Western Union (New York)	66⅛	140
Westinghouse, common (New York)	100	117½
Westinghouse, preferred (New York)	125	125

cago, Ill., was married on June 24 to Miss Caryl Cody, of Chicago. After a wedding trip including New York, New Orleans and San Francisco, Mr. and Mrs. Pfanstiehl will occupy the home now undergoing construction at Highland Park, a suburb of Chicago.

MR. A. B. WILSON, commercial manager at Plainfield, N. J., of the New York Telephone Company, was awarded the degree of Mechanical Engineer at the eighty-third annual commencement of New York University, held on June 9. Mr. Wilson was graduated from New York University as a Bachelor of Science in Chemical Engineering in 1911, and has been in charge of the Plainfield office since 1913.

MR. J. B. CRANE, for a number of years superintendent of the Great Northern Power Company, of Duluth, has announced the acceptance of a position as consulting engineer with the New York Bond & Share Company, of New York City. The change is a promotion for Mr. Crane and is in recognition of the excellent work done by him while in the service of the Duluth company.

MR. ALTON W. LEONARD, president of the Puget Sound Traction, Light and Power Company, of Seattle, Wash., MR. GEORGE R. COOLEY, of Buxbaum & Cooley, electrical supply dealers, Seattle, and MR. J. I. COLWELL, manager of the Western Electric Company, Seattle branch, have been appointed to act on the special committee having in charge Seattle's proposed celebration of "Electrical Prosperity Week," which will be held in all the large cities of the United States, November 29 to December 4.

MR. JOHN F. TRUMBULL, of New Haven, has been chosen chief engineer of the Public Utilities Commission of Connecticut, at a salary of $5,000, succeeding C. C. Elwell, who resigned to become a member of the commission. The choice resulted from a civil service examination in which Mr. Trumbull attained the grade of 97.5 per cent, Commissioners having a part in examining 15 candidates, four of whom attained 90 per cent and became eligible for the place. Mr. Trumbull is a graduate of the Sheffield Scientific School at Yale University, has engaged in railroad and electric railway engineering since graduating in 1902, and hitherto has been chief clerk to the chief engineer of the New York, New Haven & Hartford Railroad.

MR. RUSSELL H. BALLARD, who was elected a vice-president of the National Electric Light Association at its San Francisco convention recently, was born in 1875 at Hamilton, Ontario, Canada. He started his business career as an office boy in the firm of Thomson-Houston Electric Company, of Chicago, in 1890 and remained with them until 1894. During this time he improved himself by attending night school, accumulating the rudimentary principles of business in general and accounting practice in particular which he later developed to a high degree. Mr. Ballard's career is a distinctive one in that he has never deviated from his first choice, the entire 25 years of his business life having been devoted exclusively to the electrical business in one form or another. When the General Electric Company took over the Thomson-Houston Electric Company in 1894, Mr. Ballard was transferred to the treasury department of the former company at Schenectady, N. Y., from which place he was sent out to several of its branches through the East and South. In 1897 he went to Los Angeles and secured a position as bookkeeper with the Westside Lighting Company, the original of the present Southern California Edison Company. In 1900 he accepted an offer from the Butte Electric and Power Company, of Butte, Mont., as cashier and office manager, but four years later the Edison Electric Company of Los Angeles, pred-

Russell H. Ballard.

ecessor of Southern California Edison Company, induced him to return to Los Angeles by offering him the position of auditor. His rise since that time has been extremely rapid and today he enjoys the important position of secretary and assistant general manager through his untiring devotion to duty, his progressive spirit, detailed knowledge of the important questions vitally affecting the company's affairs, and his complete mastery of the many and complex problems arising daily in the operation of such a large enterprise, together with his great executive ability.

OBITUARY.

MR. RICHARD S. BROWN, one of the best known New England electrical men, died on June 5, at the home of his daughter, Mrs. H. R. Stone, 829

Richard S. Brown.

West End Avenue, New York City. Mr. Brown was 76 years old He was born and grew up in Great Barrington, Mass., and early developed a local reputation as an amateur actor, being manager of a number of productions. Later on he moved to Boston and engaged in business as a wholesale flour merchant. From there he went to New York and became connected with the Belt Railway, subsequently joining forces with the Daft Company in its early electric-railway exploitation. In 1890 he entered the services of the Westinghouse Electric & Manufacturing Company, continuing on the roll of that company until the end. Practically his entire period of service was spent as a salesman for railway apparatus. He was connected with the Boston office, to which he gave loyal and energetic support until advancing years called a halt. Of a cheerful, rugged personality, genial and witty, as is given to but few to be, his relations with his customers and his associates were close and to a remarkable degree personal. There was probably no one among the New England electrical fraternity of his day better known or more popular than R. S. Brown, who was always in demand as presiding officer for banquets or association meetings, where his inexhaustible fund of anecdotes and his quick good-natured repartee served to enliven and make successful many an otherwise dull or ordinary occasion.

DATES AHEAD.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 20-23. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Fifteenth annual convention, San Francisco, Cal., July 21-24. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

American Electrochemical Society. vancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

With the Electrical Manufacturers

The Reading Chandelier Works, 503 Penn Street, Reading, Pa., has published a 124-page catalog illustrating and describing its latest designs in electroliers, gas and combination fixtures, with glassware and colored section devoted to art domes. This catalog will be sent to those interested upon request.

The Franklin Electric Manufacturing Company, Hartford, Conn., announces the removal of its New York City office to more spacious and convenient quarters in the new Equitable Building, 120 Broadway, New York. H. J. Solon, formerly Pittsburgh manager for the Westinghouse Lamp Company, is now the New York manager for the Franklin Electric Manufacturing Company, and in charge of the new offices.

Edison Lamp Works of General Electric Company, Harrison, N. J., has issued two attractive booklets, of which the one entitled "How Our House is Wired" gives some excellent ideas and diagrams on the wiring of an old residence so as to permit liberal and ready use of electric lighting and other electrical conveniences without necessitating the general tearing up of the house for the wiring. "The Illumination of Billboards by Edison Mazda Lamps" is the self-explantory title of a booklet that describes the use of projectors with gas-filled Mazda lamps for the flood lighting of not only billboards and signs, but also of building fronts, statuary, etc.

Willy Lamot, Shardhighs, Halstead, Essex, England, announces that several Belgian business men have created an organization to introduce in Belgium as soon as the war is over, American products and manufactures, and to employ as agents and representatives Belgian manufacturers and business men with capital enough to establish necessary guarantees. Those interested are requested to address their inquiries to Mr. Lamot, who suggests that owing to the risk of non-delivery, a second copy of communications be forwarded within a week or two.

The Metal Specialties Manufacturing Company, 732 West Monroe Street, Chicago, Ill., is experiencing a heavy demand for its automobile specialties. One of the innovations this company is manufacturing is the "Car-Cool" which is attached to the under side of the floor boards to prevent heat radiating through the slots and floor insulation. The equipment may be attached underneath the car irrespective of the position of the levers, and interferes in no way with the free action of the car or the taking off of the floor boards.

Fairbanks, Morse & Company, Chicago, has recently issued a booklet in which irrigation projects in many parts of the United States are attractively illustrated and briefly described. The plants shown therein are supplying, water to land growing crops of beets, wheat, alfalfa, rice, corn and potatoes, and the land irrigated is located not only in the semi-arid tracts of the west but in the southern and eastern states. One of the larger tracts mentioned is located in the beet-raising district of southern Kansas. To the land irrigated, a Fairbanks-Morse centrifugal pump delivers about four million gallons of water per day. The use of this water resulted in the yield of nineteen tons of sugar beets to the acre in the large field shown in the illustration. A very good idea, both of the machinery used and the character of the soil irrigated, may be gained from the text and illustrations in this publication, which is entitled "Practical Irrigation by Pumping."

Westinghouse Electric & Manufacing Company, East Pittsburgh, Pa., reports the following orders among those recently received: Merchants Heat & Light Company, Indianapolis, Ind., one 1,500-kilowatt, 250-volt, six-phase, 60-cycle, synchronous booster-converter with 15 per cent buck or boost; three 550-kilovolt-ampere, single-phase, 4,150-volt high tension to rotary voltage low tension transformer; one three-panel switchboard for the control of same. Scranton, Binghampton Railroad Company, Scranton, Pa., one 400-kilowatt, 600-volt direct-current, six-phase, 25-cycle, compound-wound, alternating-current self-starting, rotary converter; three 150-kilovolt-ampere, single-phase transformers; one two-panel switchboard. Woman's Hospital, New York City, one 100-kilowatt, 250-volt, compound direct-current generator suitable for reduction-gear drive. Queensborough Gas & Electric Company, Rockaway, N. Y., one 75-kilowatt, 125-volt, compound direct-current generator, and one turbine and gear for driving same. City of Seattle, Seattle, Wash., one 75-kilowatt, 125-250-volt, three-wire compound direct-current generator. Laclede Gas Light Company, St. Louis, Mo., one 30 kilowatt, 125-volt, compound generator, driving turbine and gear; one 30-kilowatt and one 75-kilowatt induction motor-generator exciter set; one 11-panel switchboard for the control of the above apparatus; a 5,000-kilowatt turbo-generator. Indianapolis City Hospital, Indianapolis, Ind., one 150-kilowatt, 125-volt compound direct-current generator suitable for geared drive. Duquesne Light Company, Pittsburgh, Pa., one 500-kilowatt, 125-250-volt, three-wire, 11,300-volt three-phase, 60-cycle, synchronous motor-generator set; one switchboard starting panel for controlling the alternating-current end of this set. Pacific Electric Railway Company, Los Angeles, Cal., one 1,000-kilowatt, 600-volt direct-current, 15,000-volt alternating-current, three-phase, 60-cycle, synchronous motor-generator set. Brooklyn Edison Company, Brooklyn, N. Y., one 1,000-kilowatt, 270-volt direct-current, 6,300-volt alternating-current, three-phase 25-cycle, synchronous motor-generator set.

Record of Electrical Patents.

Our weekly record of the United States electrical patents issued is based on the *Official Gazette* of the United States Patent Office. Owing to the practical exhaustion of the appropriation for printing the *Gazette* and specifications of patents issued, the *Official Gazette* for June 22, 1915, giving the patents issued on that date, will not be published until some time in July, when the appropriation for the next fiscal year becomes available. Our record of electrical patents of June 22 will therefore appear as early in July as receipt of the *Gazette* makes possible.

The following United States electrical patents expired on June 28, 1915:

606,199. Instrument for Calking Ships. W. P. Freeman, New York, N. Y.

606,208. Transformer Box and Hanger. L. Gutmann, Peoria, Ill.

606,279. Electromechanical Musical Instrument. G. H. Davis, New York, N. Y.

606,285. Telephone System. V. A. Gustafson, Joliet, Ill.

606,312. Electric Igniter for Gas Engines. A. J. Tackle, Oakland, Cal.

606,329. Printing Telegraph. B. A. Brooks, Brooklyn, N. Y.

606,330. Electrohydrostatic Automatic Car Brake., J. Buchel and F. McGloin, New Orleans, La.

Patents Expired.

606,342. Apparatus for Welding, Brazing and Soldering by Electricity. A. Hirsch, Berlin, Germany.

606,356. Electrical Sign. M. Norden, New York, N. Y.

606,369. Current Indicator. T. W. Varley, New York, N. Y.

606,405. Alarm System. C. Coleman, Chicago, Ill.

606,407. Dynamo-Electric Machine. R. S. Dobbie, Jersey City, N. J.

606,449. Telegraph Instrument. J. L. Cutler, Cincinnati, O.

606,450. Railway Signaling System. C. H. Davis, New York, N. Y.

606,526. Secondary Voltaic Battery. L. Epstein, London, England.

606,549. Portable Electric Drill. E. Holmes, London, England.

606,560. Regulation of Rotary-Transformer Direct-Current Electromotive Force. B. G. Lamme, Pittsburgh, Pa.

606,562. Push-Button. F. J. List, Chelsea, Mass.

606,589. System of Electrical Distribution. C. F. Scott and B. G. Lamme, Pittsburgh, Pa.

606,605. Electric Motor. J. G. Truman, Lemon City, Fla.

606,620. System for Electrical Communication. A. T. Brown, Syracuse, N. Y.

606,630. Alternating-Current Motor-Meter. J. A. Mollinger and K. Kurda, Nuremberg, Germany.

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Electric Vehicle Section

The Use of Electric Vehicles in Municipal Service.

At the meeting of the Incorporated Municipal Electrical Association held at London, England, on June 17, F. Ayton, honorable secretary to the Electric Vehicle Committee, presented an extensive and highly interesting report entitled "The Use of Electric Vehicles in Municipal Service."

The report reviews the rapid development which has been made in efficiency and reliability within recent years, and points out the many factors which make for advantage in the handling of the electric vehicle by municipalities operating electric light and power stations. Continuing, the report says in part:

"While economy in cost of operation should undoubtedly be considered an important factor in determining the system of haulage to be employed, a municipality should not lose sight of the influence that the use of any particular type of vehicle may have upon the health of the population and the amenities of the locality. It may be said, in reply to this assertion, that the vehicles which the municipality will employ are, or will be, so few, by comparison with the total of motor vehicles in use, that whatever good or bad features the type adopted may possess in the two directions mentioned, it will make no difference. So much may be granted, but it can be urged with justification that it is the duty of a municipality to set a good example in everything it undertakes. As a general rule it may be said that in the treatment of their employees, for instance, the municipalities of this country set a good example to all other employers of labor. Is there any reason, therefore, why the same broad principle should not guide them in the selection of a system of haulage? Good and useful as the horse has been, the principles of modern hygiene dictate that its continued use in congested areas is incompatible with the preservation of the best health among the populace and the maintenance of the lowest possible rate of mortality. The place of the horse has, in future, to be filled by the self-propelled vehicle, and the type which is going to eventually supersede it is that vehicle which will do the same work at the same or a lower cost and which, besides, will be characterized by silence in operation, general cleanliness and absence of odor, ease and simplicity of control, rapid acceleration, and safety in regard to the risk of fire. The electric vehicle is the only automobile taking the road today which meets fully each and every one of these requirements. It is safe to say that were the self-propelled vehicles operating in London, and other large centers, of the electric battery type, those places would, today, be very much pleasanter and healthier to live in. Here then is the opportunity for the municipalities to lead the way in regard to an improved means of locomotion the advantages of which are fully established."

The report urges municipalities to set a good example by using electric vehicles for every department. The advantages are many, and the brief test of this equipment in the work of an electric supply department of any size will soon make an enthusiast of any engineer.

Delivery vans are now in use or on order by the electric supply departments at Glasgow, Edinburgh, Derby, Westham, Croydon, Blackburn, Bootle, Hereford, Ipswich, Grimsby, Brighton, Wolverhampton, Southampton, Liverpool and the Burrough Councils of St. Marylebone, Syepney and Poplar.

These equipments are of various capacities, and the report in every case indicates that the vehicles have operated at high efficiency, low maintenance cost and with a negligible attendant charge for replacements of parts and renewals.

An interesting feature of the report is the suggestion made as to various ulterior forms of usefulness which the electric vehicle may take in municipal service. It is pointed out that in demonstration work connected with the obtaining of new business, that with the aid of a flexible cable carried through the front window, of the house from the electric vehicle standing outside in the roadway, the canvasser may be able to demonstrate the utility of many current-consuming devices.

In the collection of house refuse the electric vehicle may be used to particular advantage, because of its efficient operation where many stops and starts are to be made. It possesses the advantage also that when standing no waste of power is going on. The highly creditable performance of electric vehicles in this service is reviewed, and a number of very practical suggestions with respect to type and arrangement of vehicle are given. Furthermore, "It should be obvious that in the replacement of horsedrawn vans or carts by motor vehicles, no matter whether they be petrol, steam or electric, the latter will show the best results where the refuse destructor is at a distance from the area of collection, the saving, of course, being in the higher speed at which the motor vehicle can traverse this distance, and its greater carrying capacity. It is quite possible, on this account, that, in some towns, the best economy might be obtainable by a combination of ordinary horse-drawn vehicles for the districts in propinquity to the destructor, with the use of electric vans for the districts further away. Possibly in the latter districts, also, the local collection could be best done by horse vehicles conveying the material to a central depot from whence it would be transported to the refuse destroyer by large electric vehicles. An arrangement of this latter sort has been in successful operation in a large Continental city for some time. The horse carts are provided with removable box bodies, so that when the cart arrives at the depot, the body is lifted off it by an electric crane, and placed upon the flat platform of a large electric vehicle, which, when it has received its ful complement of these full boxes, proceeds on its journey to the destructor. In the meanwhile empty box bodies are placed upon the tumbrils which once more proceed upon their rounds of collection.

"An alternative method to that described above is the employment for local house-to-house collection of a special type of small electric vehicle, with tipping box body. In this machine, which has the advantage of possessing a low body, there is no seat for the driver; the latter stands upon a driving platform a few inches from the ground. The saving of time in getting on and off the vehicle, when compared with the ordinary type of vehicle, is obvious. For districts some distance from the destructor these small wagons could tip into a hopper, at a district depot, from which large

capacity electric vehicles could be loaded for transit to the destructor, or the small vehicles could have removable bodies which could, by means of a crane at the district depot, be placed direct—several of them—on a large vehicle for the same purpose."

The electric vehicle for ambulance work is highly endorsed. It has been employed in this service by the City of London Corporation, by the Board of London Authority and the Metropolitan Asylums Board.

Electric battery vehicles have been used to a considerable extent for fire brigade work. In this service the ease of operation and promptness of action are desirable features.

There are three municipal tramway undertakings making use of the electric battery bus as an adjunct to their tramway services. At Southend-on-Sea, South Shields and York it is understood that the vehicles are giving satisfaction.

"There are still many districts where cesspool emptying has to be done, and, where the health and comfort of the residents are studied, the vacuum tank system has taken the place of the old and crude methods. The vacuum pump is generally driven by a petrol engine in the most modern plant, but surely the aim, in constructing apparatus of this kind, which is generally put to work during midnight hours, should be to produce something which is silent in operation—and the little petrol engines employed certainly lack this feature in no small degree. It is, however, possible to construct an electrically propelled vacuum tank wagon —the usual capacity required is about 350 gallons—fitted with an electrically driven air pump. As such a pump will only need some two horsepower to drive it, the ordinary size of battery such as fitted to a three-ton wagon, would easily supply the energy required while the wagon is standing. The advantages would be that ordinary laborers could work the plant, the cost of working and up-keep would be small, and the plant would operate with absence of noise.

"The expenses of conveying the municipal officials about on their business visits and rounds, aggregate into a fairly large annual sum in any town of size, and this is especially the case where hired vehicles are concerned. It would undoubtedly pay any large municipality to invest in a few electric cars for such service, which could be garaged with the electric supply or tramways departments. The simplicity of control is cuch that chauffeurs would hardly seem necessary. The figures already quoted in this report indicate how low is the running cost of the passenger 'electric,' and this feature as well as the fact that the vehicle is free from all the starting difficulties, the vibration and the fire risk of the petrol type should act as a strong incentive towards its adoption for this particular service."

Frank Ayton.

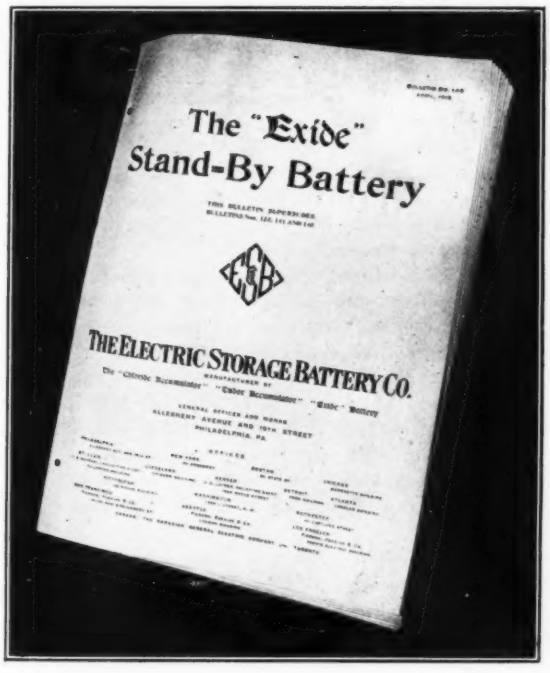
There are few electricity supply officials in England who have done so much to forward the electric vehicle movement as Frank Ayton, honorary secretary of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association. Mr. Ayton is the borough electrical engineer of Ipswich, and he is a zealous advocate of the extended use of electrics for assisting the load of public electric supply works. Writing to the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, through our British correspondent, he says:

Frank Ayton,
Honorary Secretary to the Electric Vehicle Committee, Incorporated Municipal Electric Association.

"My views on the electric vehicle question are pretty well summarized in the report I have just written for submission to the annual meeting of the Incorporated Municipal Electrical Association. Within the next few years, it is certain that street traffic in English cities and towns will be entirely motorized. From the point of view of civic amenities, from the standpoint of economy and reliability, the electric battery vehicle has advantages so unique and transcendent that it needs but that these merits should be made widely known for the greater portion, if not the whole, of that class of road traffic which lies within its rational field of utility to be dealt with by that type. The benefits which will directly, as well as indirectly, accrue to almost all branches of the electrical engineering industry by the general adoption of the electric vehicle will be so great that efforts to popularize it ought not to be confined to the central stations and the electric vehicle manufacturers alone. Every electrical man, if he has any real interest in his profession, should make himself familiar with the attributes of the modern 'electric'—many of them seem to be pretty well primed up with the failures of days gone by; let them now be equally assiduous in seeking out the reasons why the modern electric vehicle is so successful today—and then let them talk 'electric vehicle' on every suitable opportunity. That is not all—the big electrical manufacturing firms should come forward and help financially in the advertising campaign, and a much larger proportion of the electric supply undertakings might follow the lead of their more enterprising neighbors in the same direction. It must be a 'pull all together' if we are to achieve the full degree of success. It will be many years, of course, before we in England can match the results obtained on your side, but we have made a good start. What is most insistently needed, however, is the marketing of electric vehicles at a more reasonable price. It looks as if British manufacturers now starting in this field might be able to go some way in solving this problem. The best vehicles from your side cost too much to enable a wide market to be obtained."

Mr. Ayton in 1889 entered the Woolwich works of Siemens Brothers & Company as a pupil, afterwards joining the firm's staff and obtaining experience in their various departments. In 1894 he was a member of the cable engineering staff engaged upon the actual laying across the Atlantic of the Commercial Cable Company's new cable of that year. Later on, he was engaged in a similar capacity laying a cable up the river Amazon from Para to Manaos. Subsequently he was placed in charge of the electric railroad and tramways work at Siemens' head office and in that capacity superintended the carrying out of contracts for electrifying the Waterloo and City (London) underground tube and a number of tramways. In 1898 he joined the staff of Sir Alexander Kennedy, Fellow of the Royal Society, etc., one of the best known consulting engineers in England, and from that office he went to Ipswich as Sir Alexander's resident engineer upon the laying out of the electric tramways there, the construction of the power station and the laying out of the electric mains distribution system. In 1903 he was formally appointed chief engineer and manager of the combined electricity and tramways system of Ipswich.

Mr. Ayton is a member of the Institution of Electrical Engineers, of the Council of the Municipal Electrical Association, of the new Electrical Development Committee, etc.



Did You Get a Copy—

of this new bulletin on the "Exide" Stand-By Battery? It has just been published and contains 18 pages of information and illustrations which are well worth the careful attention of Central Stations.

The bulletin gives up-to-date engineering data concerning modern practice in the installation and operation of Stand-By Batteries for Central Station Service.

The extensive use of Stand-By or Emergency Batteries by many Central Stations indicates the increasing importance attached to the reliability of service such batteries insure.

Any one of our offices will be very glad to mail you a copy of this new bulletin, No. 148.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

Boston Atlanta Rochester Cleveland **PHILADELPHIA, PA.** Chicago Denver San Francisco
New York Washington Pittsburgh Detroit **1888-1915** St. Louis Los Angeles Toronto

The Electric Vehicle and the Central Station.

At the San Francisco convention of the National Electric Light Association, John F. Gilchrist, president, and A. Jackson Marshall, secretary, of the Electric Vehicle Association of America, presented an imposing and highly valuable paper entitled "The Electric Vehicle and the Central Station." The paper is replete with extended and authentic data regarding the relation of the electric vehicle charging load and the revenue of the central station, and one chapter is devoted to depicting several types of electric vehicles employed by a number of central stations. There are many charts, tables of statistics and other illustrations of immediate application to the work of the electric light and power companies.

The report states that comparatively few central stations appreciate the tremendous opportunities attending the further development of the electric vehicle, and only a few have placed their organizations properly behind the movement.

The central station can assist the sale and use of electric vehicles in two principal ways: First, use them. Second, advocate and otherwise promote their use. The central station that advocates the use of electric vehicles and proceeds to use the gas type when the electric would do the work, is creating confusion and otherwise clogging the wheels of progress. The electric vehicle will be found available for practically every department of service in the central station. The greatest obstacle encountered in the general use of the passenger vehicle by central stations is the desire upon the part of employees to use the machines for pleasure-seeking and other purposes entirely outside of the central-station work, for which they have been purchased. Where the officers of the central station insist that an electric vehicle be used for every purpose that it may advantageously, this element will soon be eliminated.

Transportation at least in cities and their suburbs will be motorized within the next ten years. If prompt and vigorous action on the part of the central station is not immediately forthcoming all chance of the electric vehicle being adopted on a proper scale will be forever lost. Prompt and sustained action is imperative.

The principal lines upon which central-station men can most rationally aid in the introduction of electric vehicles will be:

To bring home to the horse-vehicle user the very high price which he pays for animal transportation, independent of the prevailing prices at which horses, feed and other required materials may be purchased. In other words, horse transportation costs very much more for the performance of any particular work than the owner of horse equipment usually appreciates.

To analyze the performance of the work at present done by horse vehicles so thoroughly that suitable machines may be consistently recommended in any particular case.

To bring out for consideration all the advantages which machine operation carries with it in regard to precision, regularity and reliability.

In outlining the subject to avoid as much as possible diverting the prospective machine user's attention from the real issues to the relatively unimportant details of mechanical equipment.

To deal with him in terms which will enable him to arrive at a true economic value of machine installation, either as to serviceability or as a time or labor saver.

To avoid undertakings of a doubtful or experimental nature with regard to the machine's ability.

To induce the prospective user to regard the project in the same manner as he would the installation of a power plant for other purposes.

To render such assistance during the preliminary period of use as will prevent the misapplication or abuse of machines.

There should be no hesitation in making a reasonable outlay to improve conditions for the electric vehicle. The money spent is sure to return in the form of a valuable off-peak load. Many central stations already have a large income from power supplied from electric-vehicle charging.

With regard to solicitation the central station can help promote the sale and use of electric vehicles in a number of ways. If the field justifies it an experienced man can be secured to conduct an aggressive campaign. In the small city the work at the beginning can be delegated to some logical member of the staff, devoting part time to the work until results or the outlook warrant an extension of effort. The Electric Vehicle Association of America will co-operate with central stations inaugurating a campaign of this character.

Indicating methods which might be employed, the report presents a synopsis of the methods of the Commonwealth Edison Company, of Chicago, and the New York Edison Company.

The Commonwealth Edison Company devotes considerable of its space in the *Electric City Magazine* to the electric vehicle propaganda, and utilizes special advertising space in trade magazines going to directly interested constituencies. Bill-board advertising, booklets giving information regarding care and operation of batteries and vehicles, specimen record sheets, folders and maps showing location of charging stations and character of roads, moving-picture films showing electric vehicle performance and illuminated outdoor electric signs are utilized. The company has worked out an off-peak schedule applying to installations having a maximum demand of 50 kilowatts or above, which brings the rate for electricity used by the larger garages, handling from 75 to 150 cars each, down to from one and three-fourths cents to two cents per kilowatt hour. This has enabled the company to take over practically all of the vehicle-charging business in Chicago. Much attention has been given to the bettering of operating conditions, and the company has advertised the fact that specialists are retained who are at the service of vehicle users for advice and consultation. The company's representatives visit periodically all the large garages, advising with the garage owners and giving the latter the results of observations the representatives make in the various garages in the city. Twenty-one substations have been equipped for emergency charging with duplicate parts, and in the outlying districts motor-generator sets of ample capacity to give 200 ampere booster charges to electric trucks have been installed. The company carries on a plan of co-operative advertising whereby vehicle agencies and the central station combine in various localities to carry on an advertising campaign. The company also pays commissions to those of its representatives who are instrumental in the selling of electric vehicles.

Four years ago the New York Edison Company established its Automobile Bureau, and the man placed in charge was instructed that his duty was to co-operate in every way possible with the electric vehicle manufacturers who were selling in New York territory.

After the Bureau became acquainted with all local electric vehicle-selling agencies, it set about the task of getting in touch with the users of "Electrics." A list of New York City automobile registrations was obtained from the Secretary of State, the electric-vehicle owners selected therefrom and listed on cards. A list of customers taking service from the company for charging purposes was next obtained. Calls were then made on all persons whose names appeared on either list, the preliminary record was checked and a permanent record established. This record is kept on cards which show the name of the owner of the car and his address, the make of the car, where it is garaged and the source of the charg-

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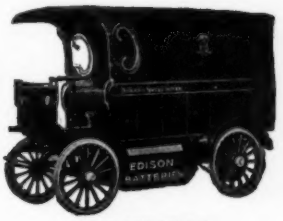


LOS ANGELES

DETROIT

CHICAGO

WINNIPEG

The Edison Storage Battery and the Battery Exchange System

NEW YORK

NEW YORK

NEWARK

THE "Battery Exchange" System of Electric Vehicle Operation gives the Central Station a profitable and advantageous load that is awaiting development in practically every city of the country.

In the "Battery Exchange" System the Central Station owns the Batteries and the Customers pay for the Vehicles alone. The low price and small operating cost afford a sales argument to the customers that cannot be denied. The increased revenue to the Central Station is obtained at a minimum selling effort and expense. **Central Stations can double their vehicle load in a few months by this method.**

CHICAGO

LONG ISLAND CITY

On account of its permanent reliability, negligible maintenance cost, high-service efficiency and long life the Edison Alkaline Storage Battery is the most economical equipment for this duty.

BOSTON

BOSTON

Before Adopting a "Battery Exchange" System Get Our Proposition

NEW YORK

Edison Storage Battery Company

Main Office and Factory, Orange, N. J.

ST. PAUL

Distributors in New York, Boston, Chicago, Cleveland, Washington, San Francisco, Los Angeles, Portland, Ore., Seattle

The Vehicles of a few representative users of Edison Batteries are shown in the border.

CHICAGO

FORT WAYNE

SEATTLE

NEW YORK

ing current, whether Edison service or a private plant.

This list of vehicle owners is kept up-to-date by daily reports from the State Automobile Registration Bureau, and whenever a new registration appears the car owner is interviewed, the purpose of the Automobile Bureau explained and its services offered. The Bureau aims to keep in touch with the operation of every "Electric" in the city, and whenever possible, performance and cost data are obtained. A call is made at least once annually on every user in the city.

Owners of cars and electric-vehicle manufacturers were advised by letter that the Company had established an Automobile Bureau and stood ready to assist in the care and operation of electric vehicles.

The next very important step was the establishment by the Company of twenty-two outlet charging stations throughout the city. This network of emergency charging-stations covers the city very completely, and it never happens that a vehicle wanting a boost is too great a distance from the supply of charging current.

A booklet containing a list of all garages and charging stations within a radius of 100 miles of New York City is published annually by the Company, and given wide distribution. Electric vehicle and storage-battery manufacturers are advised that they may have as many copies as they may want for their own mailing lists or for their showrooms.

The Automobile Bureau of the New York Edison Company is now composed of eight people, one of the number being a woman, who makes demonstrations and gives driving lessons in any of the cars offered for sale in the city. One of the men is an office engineer, who collects and compiles statistics and all the performance and cost data he can get hold of.

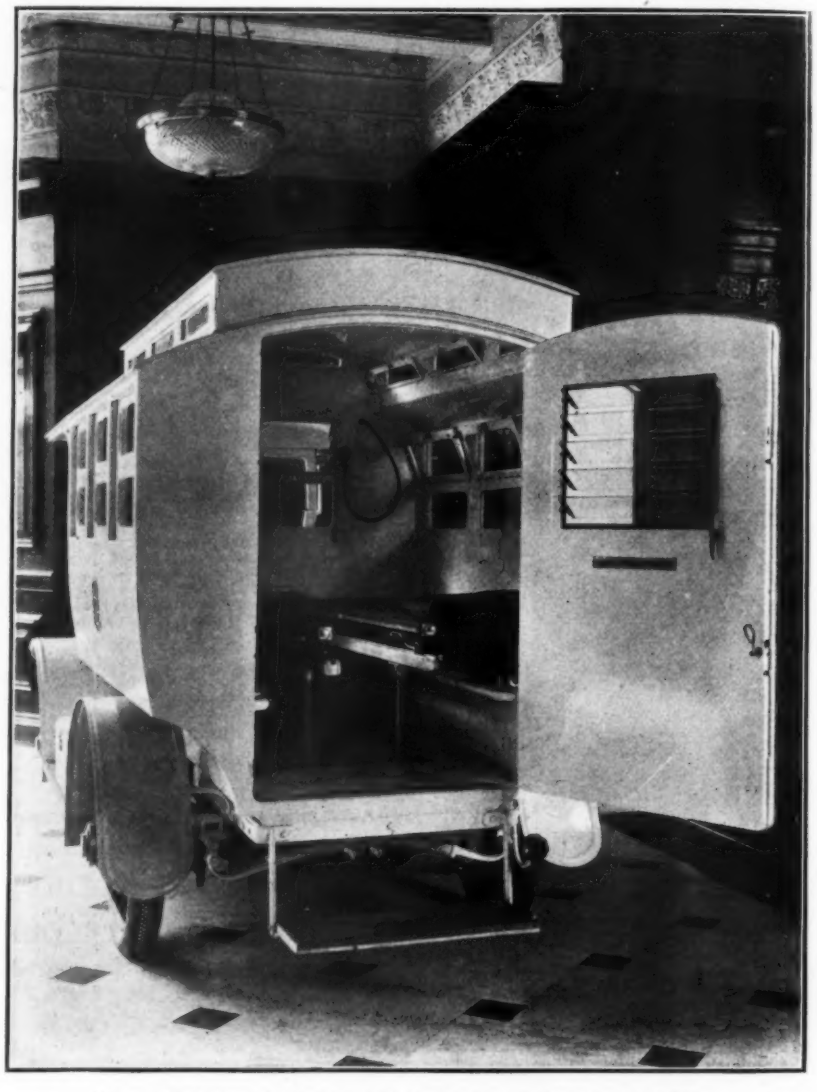
If the electric-vehicle purchaser will permit, the Bureau will direct the installation of the necessary garage apparatus and give advice as to proper maintenance of the vehicle. If the purchaser does not wish to care for the car himself he is supplied with a list of nearby garages where satisfactory service may be obtained. In this manner the service of the Bureau is two-fold: first, by arranging garaging facilities for the new car, and, secondly, by increasing the business of the garage man who is trying to earn a lower rate.

Another duty of the Bureau is to select and maintain a list of New York business houses now using horse-drawn vehicles, but whose volume of business handled seems to warrant the adoption of a more economical mode of transfer. This list is circularized at intervals and attention is drawn to the advantages to be derived from the use of electric trucks. A reply to one of the letters being received, a representative immediately calls and determines the requirements of the case, submitting interesting performance data, and figures on cost of operation and maintenance. He also has with him a list of satisfied users of electric vehicles. With the prospective purchaser's permission his name is sent by letter to the local representatives of the different electric vehicle manufacturers, with the request that descriptive matter be sent and followed by a salesman. The Automobile Bureau becomes acquainted with the salesmen in the case and keeps in touch with the progress made, giving information where it is wanted on the cost of charging current and the necessary charging apparatus.

The company spends a good part of its advertising appropriation on electric-vehicle publicity. Space is purchased in both newspapers and magazines, and each advertisement carries the names and addresses of all electric vehicle-selling agencies in the city. Copies of its advertisements are always sent to vehicle manufacturers, irrespective of whether they are represented in the city or not. It is interesting to note that two years ago there were but eight or nine manufacturers represented in New York, while at the present writing there are twenty-one agencies or branches.

Electric Ambulance for Durban.

The accompanying illustrations depict what is believed to be the first electrical motor ambulance used in South Africa. It has been supplied to the City Corporation of Durban by Carters, of London, ambulance specialists. The mounting of the vehicle and the design of the body with the interior accommodation are quite new. The chassis is in type identical with those now in use in the city of London. It has Greenwood and Batley's eight



View of Interior of Electric Ambulance for Durban, South Africa.

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs., Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America. President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. **Price, $2.00.**

CHAPTERS

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
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III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
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Electrical Review and Western Electrician

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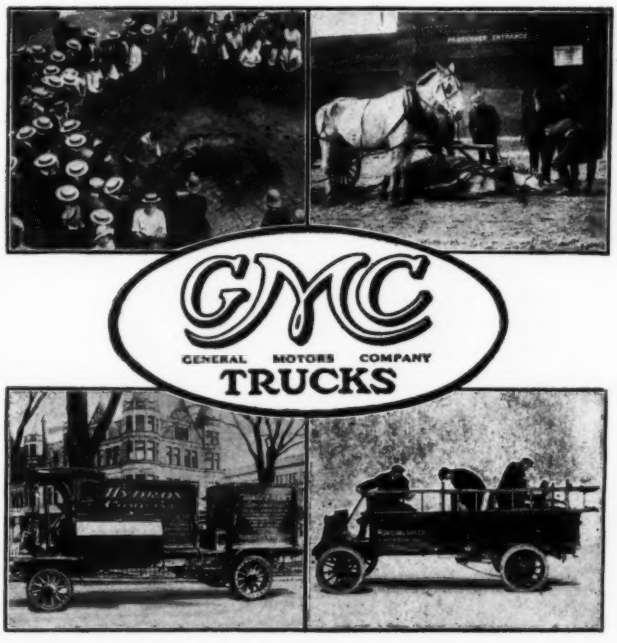
Relief From Heat Stricken Haulage Service



Past experience proves that the delivery and haulage service of thousands of merchants is being crippled every year by the summer's broiling heat. All this can be avoided and millions of dollars saved by the substitution of motor trucks.

This applies with equal force to the delivery and haulage work of business houses and the service of central stations that still rely on horse-drawn equipment. The maintenance of good service demands your anticipation of summer heat conditions. And you can safely do this by installing GMC Trucks. You can select from our comprehensive line a machine that will fit your service with utmost economy and satisfaction.

Now is the time to look the situation squarely in the face—to insure prompt service to your customers and yourself—to guard against unnecessary expense either in your construction or repair departments.

Whether you are considering the installation of trucks in your own service or desire data for one of your power customers—you can secure complete co-operation from the nearest GMC dealer or from our factory. We can supply a heat-proof hauling machine for any service—one that will meet its requirements exactly.

GENERAL MOTORS TRUCK CO

One of the Units of
General Motors Company

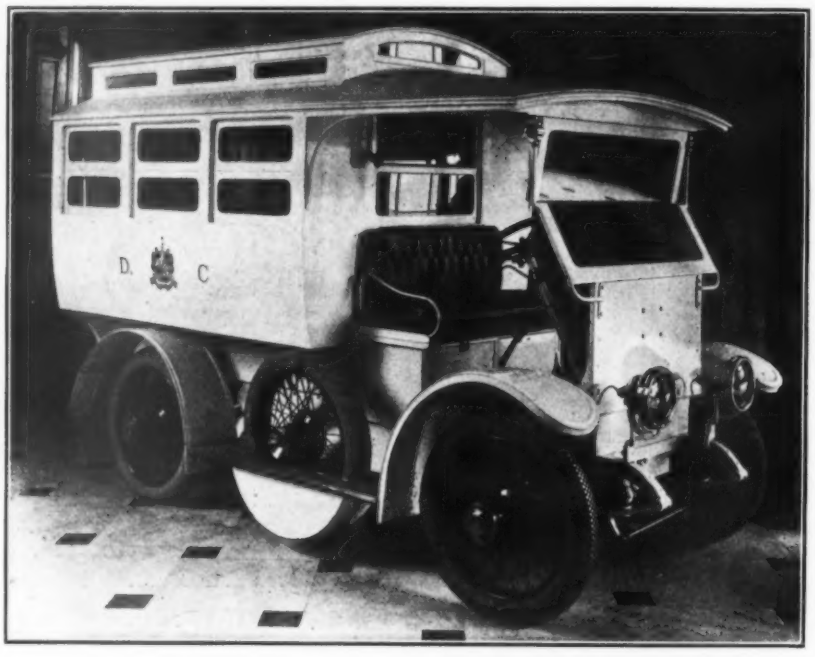
PONTIAC MICHIGAN

Direct Factory Branches: New York, Boston, Chicago, Philadelphia, St. Louis, Kansas City, San Francisco

(17)

horsepower twin motor and Tudor KYB9 type battery.

The car is fitted with six speeds forward, reverse, and electric brake, in addition to hand and foot brakes. It is mounted on Rudge Whitworth steel



Electric Ambulance for Durban, South Africa.

detachable wheels, complete with spare wheel, and Dunlop pneumatic tires. Teak is used and the car is finished in white Ripolin. The interior is lined with aluminum and finished in white Ripolin. Accommodation is provided for two invalids or injured cases, the stretchers being fitted with patent extension gear which enables the patient to be loaded without the attendant climbing into the car. There is a metal aseptic detachable seat inside the car for nurse, metallic speaking tube from driver to nurse, complete first aid equipment, etc.

Mercury Industrial Tractor.

To facilitate and reduce the cost of baggage and freight handling in railroad depots, freight houses, steamer docks, and various kinds of warehouses, the use of electrically-driven trucks has steadily increased in recent years. In some cases, however, the investment in a fleet of such trucks is a stumbling block that has retarded the more general use of such equipment.

It has occurred to engineers who have studied the problem of expeditions and economical freight handling that in such cases the solution lies in the use of one or several electrically-driven tractors designed for large tractive effort so as to be capable of hauling a train of ordinary four-wheel hand trucks, such as are commonly in use about freight and warehouses. This type of tractor can be employed continuously without losing any appreciable time waiting for loading or unloading. Thus a group of the ordinary trucks are loaded in the warehouse or shipping room and assembled into a train. As soon as ready the tractor draws up and pulls the train to the railroad cars or into the shop hold, returning with a train of empty trucks ready to be reloaded. In the meantime another batch of trucks has been loaded and made ready for the tractor. In unloading cars, vessels or drays, the same procedure is followed, the tractor being in constant active service and thus earning the largest return on its investment.

The tractor serves admirably also in hauling partly finished goods from one department to another in large manufacturing plants. In all these uses, it reduces the cost of handling goods, since hand trucking is practically eliminated. A comparatively small number of stevedores, loaders, unloaders or checkers is required The goods are also handled with much greater dispatch.

The electric tractor designed particularly to meet the conditions discussed in the foregoing is illustrated in the cut herewith, which gives an excellent idea of its capacity in this service. This tractor is built primarily to pull and has no provision for carrying anything but the operator, storage battery, controller and motor. It is a very compact and ruggedly built machine with channel-iron riveted and welded frame. The battery box accommodates any standard storage-battery trays and any battery selected by the purchaser may be installed. The battery is to have a capacity of 250 ampere-hours. By placing the battery box directly over the two rear wheels, which are the drivers, maximum tractive effort is obtained.

A heavy-duty Westinghouse motor with ball bearings is used; it has liberal overload capacity. The controller provides for four speeds forward and two reverse. The handle of the controller is automatically locked when the driver leaves his seat. Power is transmitted from the motor to the rear axle direct through a worm-gear drive.

On the rear axle are two contracting brakes with a friction surface of 130 square inches. These brakes are controlled by a pedal. Their bands are lined with wire-woven asbestos. The rear driving wheels and the single front steering wheel are of special steel and

The Mercury Industrial Tractor.

equipped with extra large solid rubber tires rigidly pressed on. All wheels have roller bearings. Steering is by a simple lever direct to the steel fork supporting the front wheel. This fork turns on cup and cone ball bearings.

These electric tractors are built by the Mercury Manufacturing Company, 4100 South Halsted Street, Chicago, Ill.